Appendix D. Details of Accomplishment by Project

The following sheets provide metadata information about the project – citation, abstract, key words, start and end date, primary investigator and institution. For inventory program purposes, additional information was provided which included employee names, data summaries, results and discoveries, and products produced. If the BibKey # is included, it refers to the unique number provided to the citation by the NatureBib database application. A form was developed to contain relatively the same information for every project. Some of the projects were partially or fully funded by other sources but the information was included in the inventory summary analyses. [*Note that budget expenditure information has been removed from this appendix per the guidance of the National I&M Program.*]

Inventory Project Accomplishments

Project title: **Data Mining** (A.1) *Park*: All

1st Date started: 5/2000 *Date finished*: 2/2001 *Total elapsed time (months)*: 25
2nd Date started: 3/2003 2/2005

1st Primary investigator: Marsha Irving-Semenoff *Institution:* USGS-BRD
2nd Primary investigator: Jennifer Bjork *Institution*: NPS, SFAN

Project abstract: The project goal was to fill specific data gaps, enter species into NPSpecies databases, and certify their accuracy. This was accomplished by hiring several biological technicians as data miners. They were supervised by Network staff to centralize the function in order to coordinate searches and to standardize new entries and verification of species databases. Centralization made searches more efficient, consistent, and avoided repetition by individual parks. At the beginning of each year, parks were polled for their top needs. As inventories were completed, data miners ensured data was in NPSpecies, or entered it themselves.

The goal to fill data gaps was achieved. From 2000 to the end of FY2004, species listed in NPSpecies grew from 5,176 to 9,258 species. By August, 2004, seventeen NPSpecies data bases were certified through the quality assurance checking process. Databases that are certified can be used with certainty that the species names are correct and that the species are actually present in the parks.

Method: Primary evidence of species occurrence were used and included museum specimens, photographs, research and other technical reports, and wildlife observations by acknowledged technical specialists. Searches for evidence lead data miners to park file cabinets and specialists, academic institutions, museums, other agencies, and conservation groups such as PRBO and the Golden Gate Raptor Observatory. Citations were added to the national NatureBib database and species data were entered into the national NPSpecies database.

In order to develop the most complete species lists possible, the tactic was to find at least one piece of evidence for every species. A list was created of the taxa without any evidence. A search for those species was made. Once evidence was found for a species, the data miner would move to the next species without evidence. Fortuitous discoveries of species not on the list were added to the databases. In using this tactic, the project did not develop complete, comprehensive reference lists for any taxon.

After the databases were populated, park specialists reviewed them for completeness and filled in blank fields to the best of their ability. As part of the quality assurance process, the specialists also selected the preferred "local name" and park status.

Employees hired: All employees were Biological Technicians

1st group (FY2000-FY2001)				
Ackerman, Jill	GS-5	0.3 FTE		
Davis, Amber	GS-5	0.0 FTE		
Press, David	GS-5	0.6 FTE		
Repko, Melinda	GS-5	0.2 FTE		
Van der Leeden, Pam	GS-5	0.0 FTE		
2nd group (FY2003-FY2004)				
Egan, Stephanie	GS-7	0.2 FTE	#8530-508	
Grant, Andrew	GS-5	0.3 FTE		
Hooten, Chris	GS-5	0.6 FTE		
Langston, Amy	GS-5	0.4 FTE		
LoBianco, Ro	GS-5	0.7 FTE	#8530-503	$ 2,644
LoBianco, Ro	GS-7	0.6 FTE	#8530-511	$27,676
Trabold, Vicki	GS-7	0.2 FTE	#8530-510	$ 8,665
Zamzow, Kendra	GS-5	0.2 FTE		
TOTALS		4.3		

Taxa studied:	*Pieces of evidence added*	*# species entered in NPSpecies*	*# databases certified*
Vascular plants	31,636	2,948	4
Amphibians	36	36	4
Reptiles	37	65	3
Fish	299	302	2
Birds	745	530	0
Mammals/bats	134	201	4
TOTAL	32,887	4,032	17

Results and Discoveries: Over 318 citations were entered into NatureBib. Over 33,100 pieces of evidence were found and entered into NPSpecies as evidence of species presence in SFAN parks. Most of the evidence was for vascular plant species (96%) for two parks, GOGA and PRES. The most valuable evidence consisted of the 3,795 voucher specimens discovered in various institutions. Vouchers made up a little over one-tenth of the added evidence (12%). A total of 17 databases (36% of the possible databases) were certified through the national quality assurance program

Citation: LoBianco, Ro. 2005. Data mining report, fiscal years 2003-2004. NPS, SFAN I&M program, San Francisco, CA. 25 pp.

Products produced: report, NPSpecies databases, and NatureBib report citations

Key words: data mining, specimen, NPSpecies, NatureBib, certification, species lists, vascular plant, amphibian, reptile, fish, bird, mammal, bat, vertebrate

Inventory Project Accomplishments

Project title: **Multi-species – Riparian** (B.2.2) *Parks*: PINN

Date started: Spring 2001 *Date finished*: 4/2005 *Total elapsed time (months)*: 48

Primary investigator: Paul Johnson *Institution:* NPS - PINN

Project abstract and goals: The main objectives of this study were to produce a complete list and voucher collection of fish and aquatic macroinvertebrate species and to examine California red-legged frog and endemic Pinnacles water beetle distribution. A total of 9 aquatic vertebrate species and 248 aquatic macroinvertebrates were identified.

Method: Non-time constrained visual encounter surveys for vertebrates were conducted in stretches of stream with enough water to support amphibian breeding. Aquatic macroinvertebrates were sampled with a combination of techniques including kick nets for the substrate (following the California Rapid Bioassessment Protocol), dip nets for the water column, forceps and aspirators for the shorelines, and aerial nets and black light traps for winged adults (mainly dragonflies, damselflies, and caddisflies). Sites were sampled until no obviously new morphospecies were collected. Specimens were sent for identification.

Employees hired:

Johnson, Paul	Aquatic Biologist	GS-07-9	1.0 FTE
Fletcher, Clay	Bio-Tech	GS-05	0.1 FTE
Gorsky, Chris	Bio-Tech	GS-05	0.2 FTE
Leonard, Rebecca	Bio-Tech	GS-05	0.4 FTE

Purchase orders for species identification:

Robert Wisseman, Aquatic Biology Associates (invertebrate identifications)
Jon Lee (invertebrate identifications)
Andy Rehn (Odonate identifications)
Steven Harris (caddisfly identifications)

Taxa studied: vertebrates (fish, aquatic amphibians, and reptiles), macroinvertebrates

Results and Discoveries: A total of 9 riparian aquatic vertebrate species were recorded consisting of 2 fish, 4 amphibians, and 3 reptiles. Threespine sticklebacks and the invasive exotic mosquitofish were abundant. Common garter snakes were found in riparian areas, especially in combination with Pacific tree frog tadpoles. Pacific tree frogs were also abundant and widespread. Evidence was found indicating dispersal of the re-introduced red-legged frogs downstream from the re-introduction site in the reservoir. A total of 248 aquatic macroinvertebrate taxa were identified, 199 insect and 49 non-insects. A total of 29 species of caddisflies were detected with the black light trap and 38 species of dragonfly and damselflies with the aerial nets. The high diversity of groups such as *Eridmidrilus* and *Hydrophile* were an indication that the PINN aquatic ecosystem is fairly healthy. The survey of macroinvertebrates was considered to be less than 50% complete, which is not unreasonable for such a diverse group of taxa. Springs, seeps, and seasonal ponds were undersampled habitats. Fall and winter were undersampled seasons.

Citation: Johnson, Paul. 2005. Riparian aquatic species inventory, Pinnacles National Monument, 2001-2004. NPS, Pinnacles Division of Research and Resource Management, Hollister, CA. 32 pp.
Products produced: report, database, maps, photographs, specimens

Key words: inventory, Pinnacles, fish, amphibians, reptiles, macroinvertebrates, red-legged frog, dragonflies, damselflies, caddisflies, Southern pond turtle, mosquitofish

Inventory Project Accomplishments

Project title: **Multi-species – terrestrial vertebrates** (B.2.4) *Park*: EUON, JOMU

Date started: 1/2001 *Date finished*: 4/2003 *Total elapsed time (months*): 27

Primary investigator: Gary Fellers *Institution*: USGS – Biological Research Division
Park contact: Susan O'Neil, SFAN Natural Resource Specialist

Project abstract: Prior to this study, neither historic site had been surveyed for amphibians, reptiles, or mammals. The purpose of this study was to document the presence of terrestrial vertebrates. One sample site was located at EUON and four at JOMU. A total of 46 species were detected using a combination of traps, cover boards, and automatic cameras in what has come to be known as "Fisher arrays" (see http://www.werc.usgs.gov/sandiego/fisher.asp for a description of the methods).

Method: Automatic cameras were used to detect large- and medium-sized mammals and arrays of pitfall traps, cover boards, and Sherman traps, to document small mammals, reptiles, and amphibians. Sites were established in January and February 2001. On Mt. Wanda at JOMU, each array was a roughly linear transect of drift fence with 20 Sherman traps. At EUON, two Sherman traps were placed near each of the ten artificial cover boards. Twenty-five cover boards were located at JOMU. The automatic cameras were modified Olympus Mini DLX triggered by a Trailmaster 1500 unit. The unit was comprised of a transmitter and a receiver. The transmitter produced infrared beam of light crossed a wildlife trail at a height of about 8 inches. Two cameras were used at EUON and four, at JOMU, one of which was stolen. Observations and searches under natural cover augmented the traps and photographs.

Employees hired (employee name, #, title, grade, FTE): None

Taxa studied (list below):	*EUON # of species*	*JOMU # of species*
Amphibians	1	5
Reptiles	5	5
Native mammals	8	10
Non-native mammals	5	7
TOTAL	19	27

Results and Discoveries: Automatic cameras documented 12 species of mammals at JOMU and 10, at EUON. Two introduced species were documented at both sites, the Eastern fox squirrel and the opossum. Birds were also photographed by the cameras. The most interesting were the screech owl, great horned owl, and the introduced wild turkey, all at JOMU. Most species that were known to occur in the parks but weren't detected and documented during the surveys fell into two categories: 1) species for which there is marginally good habitat, or 2) species that occur at fairly low densities. Additional trapping and photography may eventually detect the missing species.

Citation: Fellers, Gary M., Leslie Long, Greg Guscio, and David Pratt. 2004. Final report of inventories of terrestrial vertebrates at John Muir National Historic Site and Eugene O'Neill National Historic Site. USGS Western Ecological Research Center, Point Reyes Station, CA. 17 pp. BibKey # 548996

Products produced: report, database, maps, and photographs

Key words: inventory, amphibian, reptile, vertebrate, mammal, array, automatic camera, JOMU, EUON

Inventory Project Accomplishments

Project title: **Multi-species – terrestrial vertebrates** (B.2.4) *Park*: GOGA

Date started: 7/1990 *Date finished*: 9/1998 *Total elapsed time (months*): 86

Primary investigator: Marcia Semenoff-Irving and Judd Howell *Institution*: USGS – BRD
Park contact: Daphne Hatch, GOGA Chief of Natural Resource Management

Project abstract: A field inventory for terrestrial vertebrates was conducted

Method: Ten-meter circular plots were installed and inventoried between July 1990 and September 1997 (24 survey months). The 456 plot locations were chosen to provide geographic completeness and to capture the habitat diversity within the approximately 76,000 acres of the park. Plot locations were selected randomly from either remotely-sensed images, aerial photographs, or digital orthophoto quadrat maps. Each circular plot consisted of a pitfall trap, Sherman live trap, cover board, and track plate station arrayed around the plot center. Trap surveys were conducted for ten consecutive days, with plots checked each morning. Surveys were conducted during the summer months (July through early September).

Pitfall traps were 5-gallon plastic buckets placed 5-meters from the plot center and baited with peanut butter and rolled oats. Buckets and live traps were lined with leaf litter to prevent desiccation of amphibians and cotton to prevent hypothermia. Track stations consisted of sooted 40 X 80 aluminum sheets baited with a punctured can of cat food. Cover boards were 30 X 30 X 7-cm plywood squares.

Budget expended: Interagency Agreement with USGS-BRD and follow up with funding from California Department of Fish and Game - no inventory funds

Employees hired (employee name, #, title, grade, FTE): None

Taxa studied (list below):	*# of species*
Amphibians	4
Reptiles	10
Mammals	27
TOTAL	41

Results and Discoveries: Over 24,701 trap nights, surveyors recorded 6,140 detections of all species. A total of 41 vertebrate species were detected. The deer mouse was by far the most common vertebrate recorded followed by the California vole. There were seven occurrences of the salt marsh harvest mouse, a threatened species. The most common amphibian was the California slender salamander and reptile, the Western fence lizard. The gray fox and raccoon were the most often detected larger mammals. Bobcats were recorded more frequently than black-tailed deer. Domestic non-native mammals, dogs and cats, were documented in the park.

Level of effort: 6,140 captures/detections/24701 trap nights = 0.2 capture or detection per trap night

Citation: Semenoff-Irving, Marcia and Judd A. Howell. 1999 Inventory of terrestrial vertebrates, 1990-1997. Golden Gate National Recreation Area, California. USGS Western Ecological Station, CA.

Products produced: report, poster-presentation, photographs

Key words: inventory, amphibian, reptile, vertebrate, mammal, circular plot, GOGA, mouse

Inventory Project Accomplishments

REPORT PENDING

Project title: **Multi-species – terrestrial vertebrates** (B.2.4) *Park*: PINN

Date started: 9/2003 *Date finished*: 3/2005 *Total elapsed time (months)*: 18

Primary investigator: Jim Petterson *Institution*: NPS

Park contact: Jim Petterson, PINN Wildlife Biologist

Project abstract: A field inventory for terrestrial vertebrates was done in PINN. using a combination of traps, cover boards, and automatic cameras in what has come to be known as "Fisher arrays". All species were entered into NPSpecies by park staff.

Method: An Interagency Agreement with the USGS-BRD, Robert Fisher, was signed to develop the sampling strategy. Park staff actually installed and conducted the survey. Fourteen of the twenty sampling arrays were installed. These consisted of automatic cameras to detect large- and medium-sized mammals and arrays of pitfall traps, cover boards, and Sherman traps, to document small mammals, reptiles, and amphibians. The automatic cameras were modified Olympus Mini DLX triggered by a Trailmaster 1500 unit. The unit was comprised of a transmitter and a receiver. The infrared beam of light generated by the Trailmaster crossed a wildlife trail at a height of about 8 inches. This method used a combination of standard capture techniques:

Employees hired (employee name, #, title, grade, FTE):

Taxa studied (list below):	*# of species*	*capture rate*
Amphibians		
Reptiles		
Mammals	_	
TOTAL		

Results and Discoveries:

Citation:

Products produced:

Key words: inventory, amphibian, reptile, vertebrate, mammal, array, automatic camera, PINN

Inventory Project Accomplishments

Project title: **Multi-species – terrestrial vertebrates** (B.2.4) *Park*: GOGA, PORE

Date started: 1/1998 *Date finished*: 8/2001 *Total elapsed time (months*): 43

Primary investigator: Gary Fellers *Institution*: USGS – Biological Research Division
Park contact: Dawn Adams, PORE I&M Coordinator

Project abstract: A field inventory for terrestrial vertebrates was done. Fourteen of the sixteen sample sites were within the PORE boundary. Forty-seven different species were detected using a combination of traps, cover boards, and automatic cameras in what has come to be know "Fisher arrays". Capture rates for each species were recorded. Most species, except vagrant shrews, deer mice and a few other species, showed a preference for either wooded or non-wooded sites. Data show that an inventory at PORE could be accomplished in two trapping seasons – mid-summer and mid-winter. We also learned that two-years of sampling provide a good inventory since very few additional species were detected during the third year of inventory.

Method: Automatic cameras were used to detect large- and medium-sized mammals and arrays of pitfall traps, cover boards, and Sherman traps, to document small mammals, reptiles, and amphibians in or near PORE. The first eight sites were established in January and February 1998. An additional eight sites were added in February 2001. Two habitat types were sampled – wooded (pine, fir, redwood, riparian zones) and non-wooded (scrub, undisturbed grassland, pasture, and dune). At each site, one automatic camera and four arrays were installed. Two of the sixteen sample sites were on GOGA north lands and fourteen in PORE. Each array consisted of three equally spaced arms radiating from a central pitfall trap. Each arm was a 10 m long drift fence. A second pitfall trap was 10 m from the end of each arm. A single cover board was located 5 m past the end of each drift fence. The automatic cameras were modified Olympus Mini DLX triggered by a Trailmaster 1500 unit. The unit was comprised of a transmitter and a receiver. The transmitter produced infrared beam of light crossed a wildlife trail at a height of about 8 inches. It took approximately 12 person days to assemble the materials and install the arrays and camera at each site. This method used a combination of standard capture techniques.

Heyer et al. 1994. Measuring and Monitoring Biological Diversity, Standard Methods for Amphibians. Smithsonian Institution Press. 364 pp.
Wilson et al. 1996. Measuring and Monitoring Biological Diversity, Standard Methods for Mammals. Smithsonian Institution Press. 409 pp.

Employees hired (employee name, #, title, grade, FTE): None

Taxa studied (list below):	*# of species captured*	*# of species photographed*	
Amphibians	7	-	
Reptiles	9	-	
Mammals	16	18	3species by both methods
TOTAL	47 species terrestrial vertebrates entered into NPSpecies		

Results and Discoveries: Automatic cameras were in operation for 8,525 camera days (83% of the time) resulting in 7,485 identifiable photographs. There were 24,072 checks of Sherman traps yielding 3,920 captures. There were 28,952 checks of pitfall traps yielding 4,597 captures and 3,144 checks of cover boards yielding 2,020 captures. Capture rates and seasonality of captures for each species were provided tables and graphs.

Citation: Fellers, Gary M. and David Pratt. 2002. Terrestrial vertebrate inventory, Point Reyes National Seashore, 1998-2001. USGS Western Ecological Research Center, Point Reyes Station, CA. 75 pp. BibKey # 548479.

Products produced: report, database, photographs, and maps.
Key words: inventory, amphibian, reptile, vertebrate, mammal, array, automatic camera, PORE

Inventory Project Accomplishments

Project title: V**ascular plants - herbarium assessment** (B.2.5) *Parks*: GOGA, MUWO, PORE, PINN

1st Date started: 6/5/00 *Date finished*: 1/26/04 *Total elapsed time (months)*: 43

Primary investigator: Roy Buck and Glen Clifton *Institution:* EcoSystems West
Park contact: Barbara Moritsch and Jane Rodgers

Project abstract: The goal of the project was to evaluate park herbaria for completeness. Contractors cross checked park herbaria and park species lists to find errors and gaps in each herbarium collection.

Method: Contractors examined park voucher specimen condition and general storage conditions. They looked at the taxonomic identification of each voucher and attempted to correct it, if in error, using the Jepson Manual (Hickman 1993). Gaps in the herbarium collection were identified and an attempt was made to complete missing information by collecting plant specimens. Where possible, cross-checks were made with other herbaria searching for plants collected in the parks.

Employees hired: None

Taxa studied: Vascular plants

Results and Discoveries: A summary was prepared for each park listing respective plant taxa on the species list which were or were not represented in the park herbarium. The listing was broken down into native and non-native taxa. Another list was prepared for plant species on herbarium accessions list that were not listed on the species list. The third list was for any special-status plant taxa on park species lists with an indication of which were represented in the park herbarium. During the 2001 and 2003 field seasons, Ecosystems West botanist, Glenn Clifton, collected 221 specimens of vascular plant taxa not previously represented in the PORE herbarium. The PINN herbarium was evaluated in February 2002.

Park	*# of catalogued specimens*	*# of taxa represented*	*#of Corrected ID's*	
GOGA	228	187	10	(majority of collection from MUWO)
PINN	533			
PORE	399			

Citations:
Buck, Roy. 2003. Evaluation of the Golden Gate National Recreation Area herbarium. EcoSystems West, CA. 3 pp.

Products produced: report, spreadsheets, and voucher specimens

Key words: herbaria, voucher, plant specimen

Inventory Project Accomplishments

Project title: **Vascular plant survey** (B.2.6) *Park*: EUON, JOMU, POCH

Date started: 2/2002 *Date finished*: 12/2002 *Total elapsed time (months*): 10

Primary investigator: Eric Jepson *Institution:* PRBO Conservation Science
Park contact: Susan O'Neil, SFAN Natural Resource Specialist

Project abstract: The purpose of the study was to document plant species richness of three NPS units in the East Bay of San Francisco.

Method: Systematic surveys were performed. Plant identification was done on site as much as possible. Taxonomy and nomenclature were based on Jepson's Manual for Higher Plants in California (Hickman et al. 1993). Photographs were taken of representative vegetation types and rare plants. GPS locations were recorded for locations of rare plants and target non-native species.

Employees hired:

Smick, Geoff	Bio-Tech	GS-5	0.1 FTE	worked in JOMU herbarium

Taxa studied:

Location	*# of Species*	*# of Families*
EUON	172	55
Mt. Wanda (JOMU)	283	66
J. Muir House (JOMU)	225	75
J. Muir gravesite (JOMU)	94	45
POCH	55	20
Total	468	

Results and Discoveries: Vegetation surveys detected 468 plant species on all 3 units, 357 of which were naturalized, including both native and introduced species. Forty-nine of the introduced species were listed as noxious weeds. Only 55% of the plants that were found were native to California. Species still remain to be discovered, especially on Mt. Wanda. Following a wildland fire, native species dormant in the seed bank could temporarily grow and bloom. The effects of intensive grazing on Mt. Wanda were still evident, both in the contour of the land and the abundance of invasive plants. The majority of native species were found in more selective habitats, e.g., mixed evergreen forest, chaparral, and blue oak woodland. Mt. Wanda is home to two Federal species-of-concern, the Mt. Diablo sunflower (*Helianthella castanea*) and the California black walnut (*Juglans californica* var. *hindsii*). Many management recommendations were provided.

Citation: Jepson, Eric P.B. and Andrew G. Murdock. 2002. Inventory of native and non-native vegetation on John Muir National Historic Site, Eugene O'Neill National Historic Site, and Port Chicago National Monument. PRBO Conservation Science, Stinson Beach, CA. 175 pp. BibKey # 389398.

Products produced: report, database, maps, voucher specimens, photographs

Key words: inventory, John Muir, Eugene O'Neill, Port Chicago, vascular plant, non-native plant, native plant, invasive plant

Inventory Project Accomplishments

REPORT PENDING

Project title: **Vascular plant survey** (B.2.6) *Park*: PINN

Date started: *Date finished*: *Total elapsed time (months)*:

Primary investigator: Tom Leatherman *Institution:* NPS, SFAN

Project abstract: PINN staff completed a two-year inventory of vascular plants on the newly acquired BLM lands.

Method: At each sample site, either a relevé, or rapid assessment, was done, depending on whether the habitat had been described.

Employees hired: All employees were Biological Technicians

DeLaveaga, Cathrine	GS-5	0.1 FTE
Hee, Shauna	GS-5	1.3 FTE

Taxa studied	*# collected specimens*	*# species entered in NPSpecies*	
Vascular plants	31,636	2,948	Check

Results and Discoveries: In 2002, 20 plants were located that had not been identified in PINN prior to this survey.

Citation:

Products produced:

Key words: inventory, vascular plant, Pinnacles

Inventory Project Accomplishments

Project title: **Birds – landbirds** (B.2.7) *Park*: EUON, JOMU

Date started: May 6, 2001 *Date finished*: 11 June, 2001 *Total elapsed time (months*): 12

Primary investigator: Jeanne Hammond *Institution:* PRBO-Conservation Science
Park contact: Susan O'Neil, SFAN Natural Resource Specialist

Project abstract: Develop the baseline for breeding bird species through field surveys. Species lists for both parks were created. Forty-one species were detected on Mt. Wanda (JOMU) and 46, at EUON. Neither list is a comprehensive list of bird species since surveys were not done during migration or during winter.

Method: Fourteen point count stations were established along one transect on Mt. Wanda that traversed all major habitat types. Three point count stations were established within EUON park boundaries and two, on adjacent East Bay Regional Park lands. All stations were surveyed three times. Area searches were also conducted at EUON to collect additional data.

Employees hired: none

Taxa studied (not including non-vascular plants and invertebrates)):

	# documented	*# species entered in NPSpecies*
Birds - EUON	46	all
Birds – JOMU	41	all

Results and Discoveries: Table 1 shows the mean number of individuals detected per station per visit. Since introduced species are included in the analysis, these measures are not necessarily good indicators of habitat quality.

Park	# pts.	Species Diversity	Species Richness	Total # Individuals	Mean # Indiv/sta./visit
EUON	5	21.03	30	162	10.8
JOMU	14	17.8	30	381	9.07

Citation: Hammond, Jeanne and Geoffrey R. Geupel. 2003. Inventory of Bird Species, Eugene O'Neill and John Muir National Historic Sites, 2001 Surveys. Point Reyes Bird Observatory Conservation Science, Stinson Beach, CA. 15 pp. BibKey # 548517.

Products: Report, database

Key words: inventory, landbirds, baseline, point-count, Eugene O'Neill, John Muir, species diversity, species richness

Inventory Project Accomplishments

Project title: **Birds – landbirds** (B.2.7) *Park*: PINN

Date started: 5/7/2001 *Date finished*: 5/2003 *Total elapsed time (months)*: 24

Primary investigator: Tonya Haff *Institution:* PRBO Conservation Science
Park contact: Amy Fesnock, PINN Wildlife Biologist

Project abstract: The goal of the project was to document the occurrence of 80% of breeding landbirds within newly acquired monument lands, describe their habitat associations, and provide the park with a species list.

Method: Nine variable circular plot point count transects were established with a total of 92 sample points. Six transects were visited three times during the breeding season, between May and June 2001. Three additional transects were added to reach the goal of 80-90% documentation of species presence. These transects were surveyed in June and July, 2002. Timed twenty-minute area searches complemented the point counts. Transects were established in chaparral, pin-oak woodland, and riparian woodland habitats. General habitat characteristics were recorded at each point count station including cover, abundance, and height of each vegetation stratus (tree, shrub, and herb) in addition to maximum and minimum tree diameter at breast height.

Employees hired: none

Taxa studied: Birds

Habitat	*# of pts*	*Avg. Diversity*	*Avg. Richness*	*Avg. # Indiv/pt*	*Total # Species*
chaparral	36	7.24	8.06	14	60
pine-oak woodland	28	9.90	11.71	24	68
riparian woodland	28	11.73	13.11	22	74

Results and Discoveries: A total of 99 bird species were detected. The riparian woodland had the greatest diversity of bird species and chaparral, the fewest. Since the point count method relied heavily on detecting birds by sound, it is best for surveying songbirds with relatively small, fixed territories. Therefore, migratory and winter birds were not documented.

Citations: Haff, Tonya, Grant Ballard, Geoffrey R. Geupel, and Diana Humple. 2003. Landbird inventory of the Pinnacles National Monument: Final report. Point Reyes Bird Observatory Conservation Science Contribution #1063, Stinson Beach, CA. 35 pp.

Products produced: report, database, and map

Key words: inventory, Pinnacles, landbird, point count, diversity, richness, breeding birds, chaparral, pine-oak woodland, riparian woodland,

Inventory Project Accomplishments

Project title: **Birds – landbirds** (B.2.7) *Park*: PRES

Date started: 4/30/03 *Date finished*: 8/2003 *Total elapsed time (months*): 4

Primary investigator: Tom Gardali *Institution:* PRBO-Conservation Science
Park contact: Bill Merkle, GOGA Wildlife Biologist:

Project abstract: The report summarizes bird surveys conducted by PRBO during the summer of 2003 and compares it to the 2002 surveys.

Method: A total of 6 permanent survey locations were visited 3 times each during the summer of 2003. The variable circular plot point count method was used, as recommended by the NPS I&M program (Fancy & Sauer, 2000).

Inventory budget expended: None

Employees hired: None

Taxa studied: Birds

Results and Discoveries: A total of 34 species were noted. There were relatively few species observed using the dunes. Forster's terns were the most numerous birds in 2002, while in 2003, it was the western gull.

Citation: Gardali, Thomas. 2003. Point Count Monitoring at Crissy Field, 2003. PRBO Conservation Science, Stinson Beach, CA. 9pp. BibKey # 552745.

Products produced: report, database

Key words: inventory, bird, Crissy Field, Presidio, Golden Gate

Inventory Project Accomplishments

Project title: **Birds – landbirds** (B.2.7) *Park*: PRES

Date started: 4/30/03 *Date finished*: 8/2003 *Total elapsed time (months*): 4

Primary investigator: Tom Gardali *Institution:* PRBO-Conservation Science
Park contact: Bill Merkle, GOGA Wildlife Biologist

Project abstract: The objective of the project was to document avian diversity and abundance during the breeding season on eight sites in the Presidio of San Francisco that may undergo restoration. Four of the eight sites were surveyed in 2003.

Method: The area search method, even though less rigid than other survey methodologies, was used to document bird presence. The observers wandered the entire plot searching for birds taking notes on behavior, especially related to breeding status. Surveys began 30 minutes following local sunrise and ended between 0730 and 0845 am. Non-time constrained surveys were employed because the objective was to be thorough. Surveys were not conducted during periods of inclement weather.

Inventory budget expended: None

Employees hired: None

Taxa studied: Birds

Results and Discoveries:

Restoration site	*Acres*	*# of species*	*most abundant*
Disturbed area 3 (above Baker Beach)	3.3	13	White-crowned Sparrow/House Finch
Fill site 6 (Tennessee Hollow creek project)	6	17	House Sparrow
Landfill 10	4.5	16	W. Scrub Jay, Purple Finch
Oak reforestation	1	18	American Robin

Citation: Gardali, Thomas. 2003. Baseline bird surveys in future restoration sites in the Presidio, 2003. PRBO Conservation Science, Stinson Beach, CA. 9pp. BibKey # 552743.

Products produced: report, database

Key words: inventory, bird, Crissy Field, Presidio, Golden Gate

Inventory Project Accomplishments

Project title: **Birds – landbirds, breeding** (B.2.7) *Park*: GOGA, JOMU, PINN, PORE

Date started: 5/1/04 *Date finished*: 12/8/04 *Total elapsed time (months)*: 8

Primary investigator: Humple, Diana *Institution:* PRBO-Conservation Science
Park contact: Sarah Allen, PORE Science Advisor

Project abstract: The report summarized sites where landbird inventories and monitoring occurred and included the 2004 field season.

Method: Point count surveys followed standardized protocols in Ralph et al. (1993 and 1995). Each transect was visited three times with a minimum of ten days between visits. All visits were between late April and July. Birds that did not breed in the area or were not well surveyed by the point count methods were excluded from the count (waterbirds, raptors, pigeons, and owls). Nest searching measured nesting success.

Employees hired: none

Taxa studied: birds

Stn. Name	Park	# of pt. ct. sta.	Species Diversity	Species Richness	Index of Abundance	# prev. yrs	Habitat
Lagunitas Crk	GOGA	18	8.98	10.28	6.25	7	Riparian
Redwood Crk	GOGA	24	9.14	11.50	8.70	7	Riparian
Mt. Wanda	JOMU	14	10.33	13.14	11.38	1	Mixed
Balconies	PINN	10	10.48	12.70	7.84	1	Chaparral
High Peaks	PINN	10	6.90	13.14	11.38	1	Chaparral/woodland
McCabe Canyon	PINN	10	7.73	10.00	8.10	1	Woodland
N. Chalone Pk	PINN	8	7.29	8.63	5.38	1	Chaparral
N. Fk. Chalone Crk	PINN	12	11.04	12.67	7.16	1	Riparian
N. Wilderness Trl	PINN	14	6.30	7.07	3.86	1	Chaparral
PINN HQ	PINN	7	10.38	12.29	7.59	1	Riparian/woodland
S. Chalone Pk	PINN	10	5.00	6.30	4.50	1	Chaparral
S. Wilderness Trl	PINN	11	10.83	12.45	7.42	1	Riparian
Arroyo Honda	PORE	6	6.74	8.17	5.92	11	Mixed evergreen
Estero	PORE	9	3.26	12.70	7.84	1	Coastal scrub
Lwr Olema Crk	PORE	11	6.58	7.64	7.41	3	Riparian
Muddy Hollow	PORE	15	8.53	10.33	6.75	7	Riparian
Palomarin	PORE	13	6.89	8.15	5.49	12	Coastal scrub
Palomarin Grid 5	PORE	7	6.19	7.43	5.74	7	Coastal scrub
TOTAL		209					
	GOGA	42	9.06	10.89	7.48		
	JOMU	14	10.33	13.14	11.38		
	PINN	92	8.44	10.58	7.03		
	PORE	61	6.37	9.07	6.53		

Results and Discoveries: A total of 90 species were detected in GOGA, 46 in JOMU, 76 in PINN and 111 in PORE.

Citation:
Humple, Diana, and Thomas Gardali. 2000. Landbird inventory of the National Parks in the San Francisco Bay area: Progress report of the 1999 field season for GOGA, PORE, and PRES. PRBO Conservation Science, Stinson Beach, CA. 32 pp. BibKey # 581285.

Humple, Diana and Thomas Gardali. 2004. Landbird monitoring in the National Park Service's San Francisco Bay Area Network, A report of the 2004 field season for GOGA, JOMU, PINN, and PORE. PRBO Conservation Science Contribution # 851, Stinson Beach, CA. 33 pp.

Products produced: report, database

Key words: inventory, landbird, breeding, bird, diversity, richness, abundance, point count, Pinnacles, John Muir, Golden Gate, Point Reyes

Inventory Project Accomplishments

Project title: **Bats** (B.2.8) *Park*: EUON, JOMU, PORE

Date started: 12/99 *Date finished*: 12/31/05 *Total elapsed time (months*): 48

Primary investigator: Gary Fellers *Institution:* USGS – Biological Resources Division
Park contact: Susan O'Neil, SFAN Natural Resource Specialist, and Sarah Allen, Science Advisor

Project abstract: These three parks lacked information about the bat species. A species list was created for each park through an inventory monitoring bat echolocation sounds. This provided the needed documented evidence of bat species presence needed by the I&M program for the vertebrate inventories.

Method: The first bat monitoring station was setup at Bear Valley headquarters, PORE, in December 1999. In 2002, nine additional stations were installed: one at EUON, one at JOMU, one at GOGA (Wilkins Ranch), and 6 at PORE. All stations were setup in buildings with 110 v power for the portable computers and Anabat echolocation recorders. The stations were chosen to be near apparently good bat habitat and a source of water, e.g., pond or small stream. Known bat roost sites are in the vicinity of the PRBO station, the PORE Environmental Ed Center station, and the GOGA Wilkins Ranch station. Bat vocalizations were recorded with an Anabat bat detector and stored on a portable computer hard drive. The detector lowered the bat's high ultrasonic sounds into a frequency range. Analook software displays the sounds in graphic format similar to a sonogram, e.g., frequency versus time. Each bat species has a characteristic sonogram with some variability. In order to identify which bat made the sound, the prototype software examined 8-10 features of each call and compared the characteristics to those of calls from known species of bats.

Employees hired: none

Taxa studied: vertebrates, bats

Results and Discoveries: Nine bat species were recorded at each park. Even though each park had the same number of species detected, there were some large differences between monitoring sites. The fewest calls/day were recorded at the PORE North District office (NDOC) and at EUON. Even though the Olema Marsh station was not near a roost, a fairly large number of bats were detected. Some bat species were detected at all stations:, the Mexican free-tailed bat, red bat, and hoary bat. As call signal filtering improves, the number of bats detected may go up.

Citations:
Fellers, Gary. 2002. Acoustic inventory and monitoring of bats at National Parks in the San Francisco Bay area, 2002 progress report. USGS Western Ecological Research Center, Point Reyes Station, CA. 23 pp. BibKey # 561975.

Fellers, Gary. 2003. Acoustic inventory and monitoring of bats at National Parks in the San Francisco Bay area, 2003 progress report. USGS Western Ecological Research Center, Point Reyes Station, CA. 23 pp.

Products produced: reports, database, maps, photographs, digital echolocation sonograms

Key words: inventory, Point Reyes, Golden Gate, John Muir, Eugene O'Neill, bat, echolocation, Anabat

Inventory Project Accomplishments

FINAL REPORT PENDING

Project title: **Special taxa - rare plants** (C.3.1) *Park*: GOGA

Date started: 2001 *Date finished*: *Total elapsed time (months)*:

Primary investigator: Mike Faden *Institution:* Self-employed
Park contact: Sue Fritzke, GOGA Plant Ecologist

Project abstract:

Method: Expert choice searches were conducted by walking through survey areas. Areas were selected if they met one or more of the following criteria:

- known to contain habitat for special status species, i.e., salt marsh
- undisturbed with a high percentage of native plant species
- not extensively surveyed in previous years
- special status plants previously reported in nearby areas
- accessible to surveyors

Fifteen areas were surveyed between March and July 2003.

Employees hired: none

Taxa studied: Vascular plants, rare plants

Results and Discoveries: At the end of FY03, 18 populations of special status plants were documented, 13 through the inventory and 6 during monitoring work. There are now 33 special status plant species with a total of 200 populations recorded in the GOGA and San Francisco Watershed District. Surveys in 2002 and 2003 focused mainly on 15 areas that had been relatively survey-free, such as the shores of Bolinas Lagoon, Green Gulch, Big Lagoon, and the slopes above Tennessee Valley. Newly acquired areas in San Mateo County, Mori Point and Pedro Point, were also surveyed. Nine of the special status plants that were searched for were not found.

Citations:
Faden, Mike. 2003. Rare plant inventory report, Golden Gate National Recreation Area. NPS, Golden Gate Division of Natural Resource Management, San Francisco, CA. 41 pp.

Products produced: report, databases, and maps

Key words: inventory, Golden Gate, vascular plant, rare plant

Inventory Project Accomplishments

Project title: **Special taxa - rare plants** (C.3.1) *Park*: GOGA, PRES

Date started: 8/2001 *Date finished*: 2/28/2002 *Total elapsed time (months*): 6

Primary investigator: Pete Holloran *Institution:* Self-Employed
Park contact: Sue Fritzke, GOGA Plant Ecologist

Project abstract: This is an evaluation of past vascular plant inventories for GOGA and not a field survey. GOGA holds a large proportion of the remnant regional flora.

Inventory budget expended: none
Employees hired: none

Taxa studied): Vascular plants, rare plants

Results and Discoveries: In 1997, the GOGA vascular plant database contained 882 species. In 2002, it contained 891 species, not much change. There was no metadata with this list. In 2000, the NPSpecies database for GOGA contained 1,376 species, but not one confirmed through a reference, voucher, or observation. Neither database was complete enough to be useful.

PRES is the best-studied unit within GOGA. The baseline inventory (Vasey 1998) collected 288 vouchers deposited at the California Academy of Sciences. In 1994-5, a forest understory inventory was conducted documenting the native species. No vouchers were collected and very few species were added to the Vasey database. An analysis of the PRES flora (current versus historic) shows that there have been no species extinctions, at least 107 population extinctions (2 species Federally listed), 187 species additions, and 253 species continuities (Holloran unpubl). Rarity was not correlated with population extinction or persistence.

Park unit	# vasc. plants	
Ft. Funston	196	(Holloran 2001)
Milagra Ridge	241	(Warner 1999)
PRES	288	(Vasey 1998)

Occurrence data are the fundamental units of biological inventory. They are geographic statements anchored in time and space, e.g., Pete Holloran saw *Gilia clivorum* at Inspiration Point on 19 May 2000. The Audubon Christmas Bird Counts conducted by the National Audubon society for more than a century have resulted in a huge occurrence database and is an example of "citizen science". The Oregon Flora Project is one of the first collaborative plant projects. An occurrence database can be created without huge expense. Pete suggests maintaining the following high standard:

Source of occurrence record	QA- review by park staff specialist
1. voucher specimen	no review
2. historic observation	review for fuzzy ID & taxonomic changes
3. current observation	review for fuzzy ID & data completeness

For all current observations, he recommends metadata about "qualified" staff or volunteers to improve data quality.

Citation: Holloran, Pete. 2002. An assessment of plant inventory efforts in the Golden Gate National Recreation Area. Pete Holloran, Santa Cruz, CA. 51 pp.

Products produced: report

Key words: rare plant, Golden Gate, Presidio, inventory, assessment

Inventory Project Accomplishments

Project title: **Special taxa - rare plants** (C.3.1) *Park*: PORE

Date started: 2001 *Date finished*: 9/8/2004 *Total elapsed time (months*): 48

Primary investigator: Michelle Coppoletta *Institution:* NPS - PORE
Park contact: Jane Rodgers, PORE Plant Ecologist

Project abstract: As of 2004, 49 plant species within PORE were considered rare, approximately 4% of the flowering plants known to occur on PORE lands. This inventory was to conduct systematic field surveys of rare plants that had not previously been surveyed, in other words, look for new occurrences.

Method: Prior to going in the field, NPS employees created a database of rare plants that could be sorted by blooming period (month) and habitat type. Expert searches were conducted each month in habitats were rare plants were blooming. GPS locations were taken, the habitat was described, and threats were identified. Hand drawn polygons on topographic maps were later transferred to a GIS layer.

Employees hired:

Benson, Shelly	Bio-Tech (#513)	GS-7	0.1FTE
Coppoletta, Michelle	Bio-Tech (#013)	GS-7	0.5 FTE
Dempsey, Brita	Data-Tech	GS-5	0.1 FTE
Faden, Mike	Bio-Tech	GS-5	0.3 FTE
Skaer, Megan	Bio-Tech (#590)	GS-5	0.1 FTE
Smick, Geoff	Bio-Tech (#505)	GS-5	0.2 FTE
			1.3 FTE total

Taxa studied): Vascular plants, rare plants

Results and Discoveries: A total of 148 previously unrecorded rare plant populations were documented and mapped. These findings brought the total number of rare plant populations up to 438, an increase of 34%. In addition, 3 new rare species were added to the PORE plant list. A total of 4,346 acres (1,760 ha) were surveyed.

Citation: Coppoletta, Michelle and Meghan Skaer. 2004. Point Reyes National Seashore rare plant inventory report. NPS Point Reyes Division of Resource Management, Point Reyes Station, CA. 156 pp. BibKey # 580798.

Products produced: report, databases, maps, photographs

Key words: inventory, Point Reyes, rare plant, Adopt-A-Plant

Inventory Project Accomplishments

Project title: **Special taxa – oaks** (C.3.2) *Park*: JOMU

Date started: 1/2002 *Date finished*: 5/8/2005 *Total elapsed time (months*): 53

Primary investigator: Susan O'Neil *Institution:* NPS - SFAN

Project abstract: The goal of this project was to develop the baseline inventory for oak regeneration and for presence of Sudden Oak Death (SOD). Lack of regeneration is a serious threat to the long-term health and viability of oak woodlands throughout California. Many studies have documented a lack of recruitment to the sapling stage. Four species of oak occur on Mt. Wanda: *Quercus agrifolia* (coast live oak), *Q. kelloggii* (black oak), *Q. douglasii* (blue oak) and *Q. lobata* (valley oak). Forests dominated by oaks cover 123 (38%) of the 326 acres on Mt. Wanda and co-dominated by oaks, an additional 116 acres (36%).

Method: Random points were selected in sections (polygons) of the vegetation map with oak dominants or co-dominants. Every tree within 2 m of the 50 m long transect, run in arbitrary headings, was counted. Categories were seedling, sapling, and adult.

Inventory budget expended: none

Employees hired: none

Taxa studied): Vascular plants, oaks

Results and Discoveries: Twenty-six transects were completed. There were plenty of seedlings, but there is a bottleneck. No oak sapling was discovered in any of the transects. Blue oaks were the only oak species with more adults than seedlings. Symptoms of SOD or *Phytophthora ramorum* infection were not seen in the park or adjacent areas during or since this study. Contra Costa County has been considered an infected county since 2002 due to isolates from *Q. agrifolia* and *U. californica* from Wildcat Canyon, East Bay Regional Park District land (COMTF 2002). Management recommendations were provided.

Citation: O'Neil, Susan. 2005. 2002 Oak survey on Mt. Wanda, John Muir National Historic Site. NPS, San Francisco Bay Area I&M Program, San Francisco, CA. pp.

Products produced: report, database, maps

Key words: inventory, John Muir, oak,

Inventory Project Accomplishments

Project title: **Special taxa - lichens** (C.3.3) *Park*: PINN

Date started: 8/2003 *Date finished*: 3/2004 *Total elapsed time (months)*: 7

Primary investigator: Shelly Benson *Institution:* NPS-PORE

Project abstract: It took two approaches to increase knowledge about PINN lichens, data mining for voucher specimens and a 3-week field survey using expert approach searches in all 8 habitat types. In 2003, the PINN species list was expanded by 93 species to a total of 293. Twenty-one of the species were rare in California. Two new occurrences of the globally rare *Texosporium sancti-jacobi* were discovered which brought the park total for this species to six plants. Two voucher collections were generated, one for the park and the remaining specimens for the Santa Barbara Botanic Garden. Further inventory efforts are needed to document the presence of potentially 91 species not captured during the field component of this survey

Method: The survey used the "expert approach" method, which employed the concept of fine focused searches in areas where high diversity is expected. It was selected based on the ability to maximize the detection of species while minimizing the number of sample plots needed. The park's draft vegetation map was used to identify 8 major vegetation alliances – California buckeye, chaparral, grassland, holly-leafed cherry, oak woodland, riparian woodland, rock, and *Selaginella*. Each major vegetation type was surveyed for lichens. One weakness of this approach was that it lacked statistical power to extrapolate results to a broader, park-wide, scale. Field notes were written on the collection envelopes, photographs were taken of the specimen and habitat, and enough of the lichen was collected to cover a 3" by 5" card.

Purchase orders (#, if applies): four to identify lichen specimens – delivery date of 11/1/2003

Bratt, Cherie	Santa Barbara Botanic Garden		$2,500 for 161 specimens
Carlberg, Tom		#P853003094	$ 900 for 27 specimens
Robertson, Judy			$ 600 for 108 specimens
Tucker, Shirley	UC, Santa Barbara		$1,000 for 35 specimens

Employees hired:

Benson, Shelley	PORE plant technician	#8530-513

Cost per acre: $24,826/24,000 acres = $1.03/acre

Taxa results (non-vascular plants):

	# collected specimens	*# specimens found data mining*	*# new species*	*# species entered in NPSpecies*
Lichens	419	241	129	293

Results and Discoveries: A 3-week long field survey produced 419 collected specimens of lichens, comprising 202 species in total. Twenty-one of the species were rare in California and 129 were first recordings of the species for PINN. Two new occurrences of the globally rare *Texosporium sancti-jacobi* were discovered which brought the park total for this species to six. This *Texosporium* was found growing on different habitats than rabbit pellets, a new discovery which will expand searches for it elsewhere throughout its range. The data mining component of the survey uncovered 241 specimens that were collected from within park boundaries which comprised a total of 164 species. This project added 93 to the PINN species list bringing the total number to 293 lichen species. A complete voucher collection of specimens was provided to PINN as a reference collection. The remaining specimens were loaned to the Santa Barbara Botanic Garden. . The presence of rare species and the growing threat of air pollution extirpating sensitive lichen species from the park make it critical that PINN begin to monitor and manage to protect its lichen resources. There were 91 species that were not captured in the field component of the study. As a result, the inventory is estimated to be 85% complete.

Citation: Benson, Shelly. 2003. Lichen inventory of Pinnacles National Monument, Final Report. NPS, Point Reyes National Seashore, CA. 42 pp. (public distribution document)

Products produced: report, databases, maps, voucher specimens, photographs

Key words: lichen, Pinnacles National Monument, inventory, expert approach method, *Texosporium*

Inventory Project Accomplishments

Project title: **Special taxa – California freshwater shrimp** (C.3.4) *Park*: GOGA, PORE

Date started: July 2002 *Date finished*: February 2003 *Total elapsed time (months)*: 8

Primary investigator: Darren Fong and Ro LoBianco *Institution:* NPS-GOGA

Project abstract: The purpose of this study was to assess the current status of the shrimp in Olema Creek (GOGA) and to determine the presence and distribution of the federally endangered California freshwater shrimp in previously unstudied streams within PORE. The lower gradient sections of 13 streams were surveyed for the presence of the shrimp. A secondary goal was to collect non-native aquatic macroinvertebrate specimens as an indication of the general condition of the shrimp habitat.

Method: The field survey was conducted from July through October 2002. Only one of the 13 streams that were sampled had previously been surveyed for the shrimp. Five of the streams were tributaries of Lagunitas Creek, the site of the largest known population of the shrimp. Streams were surveyed from the mouth in an upstream direction, both sides of each creek's banks sampled equally with a single pass. A butterfly net was used under the undercut and overhanging vegetation. Approximately 100 feet was sampled in one sweep. Net captures were emptied into a white pan where individuals were sorted and identified. Unknown organisms and those of specific interest were retained as voucher specimens in vials containing 70% alcohol. GPS coordinates were taken for each location where shrimp were encountered. Besides species information, each creek was evaluated for vegetation overhang, undercut quality, water conditions, and overall suitability for shrimp.

Employees hired: Ro LoBianco, GS-6 Biological Technician

Taxa studied (invertebrates):

	# of *specimens*
California freshwater shrimp	7

Results and Discoveries: Field results confirmed the presence of the shrimp within Olema Creek near the confluence with Lagunitas Creek but not found in any other location that was surveyed. Potential shrimp-supporting creeks include Bear Valley, Glenbrook, Laguna, and Coast Creek. Results were provided by stream reach. Other species of macroinvertebrates encountered included the caddisfly, damselfly, freshwater snail, midge worm, predaceous diving beetle, water boatman, water penny beetle, scud, aquatic sow bug, stonefly, dragonfly, mayfly, dobsonfly, and crane fly. The rare Tomales asellid was found in Glenbrook Creek. An unusual mussel was found in Olema Creek, the western pearlshell mussel. The only other crustacean that was encountered was the crayfish. Fish taxa encountered included the stickleback, sculpin, juvenile steelhead trout, and unidentified salmonids. Amphibians included rough-skinned newts and red-legged frogs.

Citation: Fong, Darren and Ro M. LoBianco. 2003. 2002 California freshwater shrimp (*Syncaris pacifica*) surveys within Point Reyes National Seashore and Golden Gate National Recreation Area. NPS, GOGA Division of Natural Resource Management and Science, San Francisco, CA. 43 pp. BibKey # 566538.

Products produced: report, database, maps, voucher specimens, photographs

Key words: inventory, California freshwater shrimp, Point Reyes, Olema Creek, Golden Gate

Inventory Project Accomplishments

Project title: **Special taxa – Hymenoptera** (C.3.5) *Park*: JOMU

Date started: mid-March 2002 *Date finished*: March 2005 *Total elapsed time (months*): 36

Primary investigator: Terry Griswold *Institution:* U.S. Department of Agriculture Bee Lab
Park contact: Jennifer Bjork, SFAN Inventory Coordinator

Project abstract: An inventory of bees was undertaken since they are an essential component of biodiversity in their role as the primary pollinators of non-wind pollinated plants. Mt. Wanda supports a rich flora of 283 plant species encompassing 66 families.

Method: Two habitat types were chosen for standardized bee monitoring plots, common blue oak woodland and open chaparral. In each habitat type, one 200 by 50 m plot was defined with stakes. Sampling was conducted once every 3-weeks from mid-March 2002 to late September 2002. Pan traps and hand netting were used at both sites. Blue, yellow and white bowls (pan traps) were filled with soapy solution and were placed every 6-7 m. Once in place, aerial netting was started. Sampling was done from 0900 to 1430. All bee host plants were identified to species.

Employees hired: None

Taxa studied (invertebrates): Hymenoptera - bees

Results and Discoveries: A total of 70 species of bees in 26 genera and 6 families were collected on JOMU. The majority of the bee species collected were solitary. Eusocial Apidae (*Apis* and *Bombus*) represented only 8% of the species, but were abundant (20% of the individuals). Bee diversity and abundance peaked in early spring. Bees were collected on 19 families, 40 genera, and 45 species of plants. Five genera of plants attracted diverse bees (*Carduus, Centaurea, Holocarpha, Madia,* and *Silybum*). Bee species visited an average of 3 species of plants. Forty-six percent of all species collected were collected from plants in the Asteraceae family. Even though it provides a baseline, a limitation of this study was that there was a single year of sampling. A complete inventory would have to span several years.

Citation: Griswold, Terry, Gordon Frankie, and Harold Ikerd. 2005. The bees (Hymenoptera: Apoidea) of Mount Wanda, John Muir National Historic Site, Preliminary Assessment. USDA ARS Bee Biology and Systematics Laboratory, Utah State University, Logan, UT. 11 pp.

Products produced: report, database, voucher specimens

Key words: inventory, John Muir, Mount Wanda, bees, Hymenoptera, Apoidea,

Inventory Project Accomplishments

Project title: **Special taxa – tidewater goby** (C.3.6) *Park*: GOGA, PORE

Date started: 5/1/03 *Date finished*: 2/2004 *Total elapsed time (months)*: 10

Primary investigator: Darren Fong *Institution:* NPS-GOGA

Project abstract: GOGA and PORE were interested in determining the presence or absence of the tidewater goby in Tomales Bay, since the Giacomini Ranch, located at the mouth of Lagunitas Creek at the southernmost end of Tomales Bay, is the site of a future tidal wetland restoration project. Baseline fisheries data were also collected. The tidewater goby is a federally endangered species. It appears that the Tomasini Creek population represents the only remaining population within Tomales Bay.

Method: Sites with the habitat requirements for the goby were identified. All fish collected with dip nets or seines were identified and counted. Some voucher specimens and digital photographs were taken to help identify unknown fish. Since fish were kept in buckets, most were released upon completion of the measurements. At each site, salinity was measured and GPS locations were taken.

Employees hired: Ro LoBianco, GS-6 Biological Technician

Taxa studied: Fish, macrocrustaceans

Results and Discoveries: Densities of the Tomasini Creek population of Tidewater gobies are low, 0.2 gobies per square meter as compared to 2-40 gobies per square meter in Rodeo Lagoon (GOGA). Dense vegetation habitats in this creek reach make sampling difficult, so results may be an underestimate. Just a few species of fish were present at sites where the goby was found. These included prickly sculpin, threespine stickleback, and mosquitofish. This same fish assemblage is found in Rodeo Lagoon. For all surveyed sites in Tomales Bay, a total of 11 fish species were identified, all common to brackish water conditions. Two of the fish were introduced species, the mosquitofish and yellow fin goby. Threespine stickleback was the most frequently encountered fish, both in terms of relative abundance and number of sites. Highest fish densities were encountered at Borello Ranch and Tomasini Creek. Macrocrustaceans were found at a few locations. The introduced shrimp, *Paleomon macrodactylus*, was only found in Tomasini Creek. The introduced European green crab was found at two locations, Tomasini Creek and Borello Creek.

Citation: Fong, Darren, Tom Moore and Ryan Watanabe. 2004. Inventory of Tomales Bay Sites for tidewater goby (*Eucyclogobius newberryi*), 2002-2003, Marin County, California. NPS Golden Gate Division of Resource Management, San Francisco, CA. 44 pp. BibKey # 566547.

Products produced: report, database, voucher specimens, photographs

Key words: inventory, Tidewater goby, *Eucyclogobius*, Golden Gate, Point Reyes, Tomales Bay, Tomasini Creek, fish, macro-crustacean

Inventory Project Accomplishments

Project title: **Special taxa – Ashy Storm-petrel** (C.3.7) *Park*: GOGA, PORE

Date started: 8/21/2001 *Date finished*: 11/2002 *Total elapsed time (months)*: 15

Primary investigator: Darrell Whitworth *Institution:* Humboldt State University Foundation
Park contact: Sarah Allen, PORE Science Advisor

Project abstract: These pelagic seabirds (*Oceanodroma homochroa*) are a federal species of special concern. The project goals were to survey for nesting colonies along potential habitat including islands, offshore rocks, sea caves and the steep rocky shoreline. Petrels often nest in small well-concealed crevices and are nocturnal. There were an estimated 30 to 50 breeding pairs. Two new colonies were discovered, however, the original colony on Bird Rock appeared abandoned. No nesting sites were located in GOGA.

Method: Surveys were conducted at 5 locations along the coastal Point Reyes headlands and two along GOGA shoreline.

Employees hired: none

Taxa studied: Seabirds

Location	Estimated # of breeding pairs
Bird Rock	1-10 (47 in 1989) with 6 nests
Chimney Rock	5-10 with no nests
Pt. Reyes headlands	0
Rocks between Pt. Resistance & Double Pt. (Stormy Stack)	20-30 with 3 nests
GOGA sea caves	0 (poor habitat)
Steep Ravine	potential, further search should be conducted

Results and Discoveries: Discovery of colonies at Chimney Rock and Stormy Stack in 2001 was an indication that petrels are more widespread in central California than was previously thought. Detecting petrel colonies requires specific survey efforts, crevice searches and mist netting. Researchers believe that the colonies represent long established colonies that had been undetected due to a lack of adequate survey efforts. The colonies were all small in size, so it is likely that less than a few hundred petrels breed along the central mainland California coast. There was strong evidence that large declines at Bird Rock have occurred.

Citations: Whitworth, D.L., H.R. Carter, R.J. Young, G.J. McChesney, M. Hester, and S. Allen. 2002. Status and distribution of the Ashy storm-petrel (*Oceanodroma homochroa*) at Point Reyes National Seashore, California, in 2001. Humboldt State University Dept. of Wildlife unpublished report, Arcata, CA. 15 pp. BibKey # 548480.

Products produced: report, database, maps, and photographs

Key words: Ashy Storm-petrel, *Oceanodroma*, seabird, distribution, inventory, Point Reyes, nesting colonies

Inventory Project Accomplishments

Project title: **Special taxa – waterbirds** (C.3.8) *Park*: GOGA

Date started: 12/24/2000 *Date finished*: 2//15/2001 *Total elapsed time (months)*: 3

Primary investigator: Michael Osbourn *Institution:* NPS, GOGA intern
Park contact: Daphne Hatch, GOGA Wildlife Biologist

Project abstract: The survey objective was to survey waterbirds and shorebirds during the winter.

Method: Every two weeks, waterbirds were identified and counted at seven locations: Rodeo Lake, Oakwood Pond, Haypress Pond, Backdoor Pond, Tennessee Cove Pond, and Big Lagoon. Surveys were conducted from 0830 to 1130 in the morning. Weather and behavior were noted. A spotting scope and binoculars were used from a single observation point.

Inventory budget expended: none

Employees hired: one GS-5 aquatic technician

Taxa studied: waterbirds

Waterbody	*# surveys*	*# bird species*	
Backdoor pond	4	1	one pair of mallards
Big Lagoon	3	1	mallards
Haypress pond	4	1	ring-necked ducks
Oakwood pond	1	0	
Rodeo lake	5	3	American widgeons, greatest density
Tennessee Cove pond	4	4	highest diversity

Results and Discoveries: The highest total number of individuals for one survey was 142 observed at Rodeo Lake. Tennessee Cove pond had the highest diversity, 4 species. Five waterbirds species were observed and documented: American coots, American widgeons, mallards, pied-billed grebes, and ring-necked ducks.

Citations: Osbourn, Michael. 2001. Winter 2000-2001 waterbird survey, Golden Gate Recreation Area. NPS, GOGA Division of Resource Management, San Francisco, CA. 19 pp. BibKey # 175507

Products produced: report, photographs

Key words: inventory, waterbird, Golden Gate, Tennessee Cove, Rodeo Lake, Big Lagoon

Inventory Project Accomplishments

Project title: **Special taxa – waterbirds** (C.3.8) *Park*: GOGA

Date started: 12/12/2001 *Date finished*: 2//12/2002 *Total elapsed time (months)*: 5

Primary investigator: Kristen Dybala *Institution:* NPS, GOGA intern
Park contact: Daphne Hatch, GOGA Wildlife Biologist

Project abstract: The survey objective was to survey waterbirds and shorebirds during the winter.

Method: Every two weeks, waterbirds were identified and counted at three locations: Rodeo Lake, Tennessee Cove Pond, and Big Lagoon. Big Lagoon was divided into three-sections. Surveys were conducted from 0830 to 1130 in the morning. Weather and behavior were noted. A minimum of 15-minutes was spent with a spotting scope and binoculars from a single observation point. Water depths were measured at Big Lagoon. At approximately the lowest spot, a PVC pipe was secured over a stake.

Inventory budget expended: none

Employees hired: one Marin Conservation Corp intern

Taxa studied: waterbirds

Waterbody	*# surveys*	*# bird species*	
Big Lagoon	5	3	mallard, killdeer, bufflehead
Rodeo lake	5	4	American coot, pied-billed grebe, American widgeon Great egret
Tennessee Cove pond	3	3	American coot, bufflehead, greater scaup

Results and Discoveries: Eight waterbird species were recorded as present in the park. Rodeo Lake had the highest diversity, 4 species. Big Lagoon is a seasonal wetland. When flooded, it is still very shallow. It has the highest degree of disturbance by people, horses, and cars. Tennessee Cove pond is the least disturbed site. Birds found at the permanent ponds fed on aquatic vegetation, invertebrates or fish.

Citations: Kristen Dybala. 2002. Winter 2001-2002 waterbird survey report, Golden Gate Recreation Area. NPS, GOGA Division of Resource Management, San Francisco, CA. 24 pp. BibKey # 177300.

Products produced: report, data, maps, photographs

Key words: inventory, waterbird, Golden Gate, Tennessee Cove, Rodeo Lake, Big Lagoon

Inventory Project Accomplishments

Project title: **Special taxa – salt marsh harvest mouse and Point Reyes jumping mouse** (C.3.9) *Park*: GOGA

Date started: 10/28/02 *Date finished*: 2003 *Total elapsed time (months)*: 7

Primary investigator: John Takekawa *Institution:* USGS – Biological Research Division
Park contact: Daphne Hatch, GOGA Chief of Natural Resource Management

Project abstract: Big Lagoon currently consists of fragmented habitat types fed by intermittent freshwater flows from the Redwood Creek watershed. Since GOGA is considering restoring Big Lagoon to a functional, self-sustaining ecosystem, this portion of the mouse inventory was done first in order to determine the distribution and abundance of small mammals and to identify special status mammal species. Neither federally endangered salt marsh harvest mouse (Reithrodontomys raviventris) nor state species of special concern, Point Reyes jumping mouse (*Zapus trinotatus orarius*) were encountered in the Big Lagoon area during the survey.

Method: Small mammal surveys were conducted around Big Lagoon in Marin County in the fall (10/28/02 to 11/1/02) to reduce detection of non-resident dispersing individuals. A series of trap grids consisting of 4 Sherman live traps in each of the cardinal directions was established. Twenty-four grids consisting of a total of 96 traps were live trapped for 4 consecutive nights for a total of 384 trap-nights. Vegetative cover was characterized at each grid site.

Employees hired: none

Taxa studied: Vertebrates – small mammals

Results and Discoveries: Neither special status species was captured. Four small mammal species were detected. The western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californicus*), and the non-native roof rat (*Rattus rattus*) were abundant in that order. Western harvest mice were detected in all habitats with vegetative cover and were most abundant in pasture and wetland. The Big Lagoon vegetation reflects historic land use of wetland grazing with pasture and wetland habitats dominated by grasses, rushes, and sedges.

Citations: Takekawa, J.Y., M.A. Bias, I. Woo, S.A. Demers, and E.E. Boydston. 2003. Small mammal survey at Big Lagoon, Muir Beach, Marin County, CA. Unpubl. Progr. Rept., U.S. Geological Survey, Vallejo, CA. 25 pp. BibKey # 552676.

Products produced: report, database, maps

Key words: inventory, Big Lagoon, Muir Beach, Marin County, Golden Gate, small mammal, mice, vole

Inventory Project Accomplishments

Project title: **Mapping – vegetation map** (D.4.1) *Parks*: JOMU

Date started: 5/2004 *Date finished*: 9/2004 *Total elapsed time (months)*: 5

Primary investigator: Susan O'Neil *Institution:* NPS - SFAN

Project abstract: A vegetation map of the plant communities on Mt. Wanda, JOMU, was developed through this project. Mt. Wanda encompasses 325 acres of varied habitat including deciduous and non-deciduous woodlands, shrubland, and grassland. The mapped vegetation reflects a snapshot in time, May through August of 2004. This project was the first attempt to classify and map the vegetation communities using a fine scale.

Method: Vegetation units were determined through visual interpretation of aerial photographs supported by field sampling. Several sets of aerial photographs were used:

color aerial photograph of Contra Costa County, March 2003 1:24,000
black and white photograph of Contra Costa County, May 2000 1:20,000

Field data collection used the rapid assessment method developed by the California Native Plant Society (CNPS). Site-specific classification using ordination was not performed and the plant communities were not fully described. The U.S. National Vegetation Classification developed by The Nature Conservancy (now NatureServe) and the Association for Biodiversity Information were used to classify the vegetation. Classification is a hierarchical system with physiognomic features at the highest levels of the hierarchy and floristic features at the lower levels determining group membership.

Employees hired: All employees were Biological Technicians

Egan, Stefanie	GS-6	0.4 FTE
Ryan, Amelia	GS-5	0.1 FTE
Smick, Geoff	GS-5	0.1 FTE
TOTALS		0.6

Taxa studied: plant communities

Results and Discoveries: A total of 13 plant alliances and 18 associations were identified on Mt. Wanda.

Citation: O'Neil, Susan and Stefanie Egan. 2004. Plant community classification and mapping project: John Muir National Historic Site (Mt. Wanda). NPS, SFAN Inventory Program, San Francisco, CA. 36 pp.

Products produced: report, database, digital and hardcopy maps, field key, metadata

Key words: inventory, plant community, aerial photo interpretation, land cover map, John Muir, Mt. Wanda, Contra Costa County

Inventory Project Accomplishments

Project title: **Mapping – vegetation map** (D.4.1) *Parks*: FOPO, GOGA, MUWO, PORE, PRES

Date started: 3/12/1996 *Date finished*: 7/30/2003 *Total elapsed time (months)*: approx. 100

Primary investigator: Dave Schirokauer *Institution:* NPS - PORE

Project abstract: This plant community classification and mapping project for 155,000 acres was a joint venture between the USGS, State Parks and the NPS. Goals of the project included providing reference ecological information to park managers, putting data into regional contexts, and providing information for future inventory, monitoring, restoration, and research activities.

Method: Standard field sampling and data analysis documented plant communities which were used to create plant community keys and to describe plant communities through an ordination analysis. These data were also used as training data for aerial photo interpreters to determine the photo signature of the plant community being described. A draft map was generated for accuracy assessment for which another series of field sampling was done using the keys and map. A second iteration of photo interpreting was done to make the final land cover map. The minimum mapping unit was set at 0.5 ha.

Several sets of aerial photographs were used for this mapping project:

Type	Date	Scale	Source
Color infra-red	4/84	1:12,000	
Natural color	8/91	1:36,000	
Natural color	4/93	1:12,000	Radman Aerial Surveys
Natural color	3/94	1:24,000	NOAA
Natural color	8/95	1:24,000	Pacific Aerial Survey
Natural color	11/95	1:24,000	Pacific Aerial Survey
Color infra-red	8/96	1:12,000	Hammon – Jensen – Wallen

In addition to using the National Vegetation Classification System, a custom classification hierarchy based on ecological similarity was developed. The custom classification was developed to improve map accuracy. Plant community classification was a hierarchical system with physiognomic features at the highest level of the hierarchy and floristic features at the lowest levels. Physiognomic units have a broad geographic perspective while the floristic units have a local and site-specific perspective. Floristic levels include plant alliances and associations.

Inventory budget expended: none

Contracts: Environmental Systems Research Institute (ESRI)
California Dept. of Fish & Game Heritage Ecologist
Aerial Information Systems (AIS), Redlands

Employees hired: none

Taxa studied: plant communities

Results and Discoveries: Eighty-seven plant communities were described using 366 vegetation sample plots. Seventy-four plant communities were delineating using the aerial photo interpretation. Overall thematic accuracy varied from 44% at the association level (lowest level) to 87% at the life form level (highest level).

Citation: Schirokauer, David, Todd Keeler-Wolf, John Meinke, and Pam van der Leeden. 2003. Plant community classification and mapping project final report: Point Reyes National Seashore, Golden Gate National Recreation Area, San Francisco Water Department Watershed Lands, Mount Tamalpais, Tomales Bay, and Samuel P. Taylor State Parks. NPS, Point Reyes Division of Resource Management, Point Reyes Station, CA. 82 pp.

Products produced: final project report, database, digital and hardcopy vegetation map, plant community descriptions, field key to the plant communities, accuracy assessment report, and metadata

Key words: vegetation map, land cover, Point Reyes, Golden Gate, Fort Point, Muir Woods, Presidio, Angel Island

Inventory Project Accomplishments

Project title: **Mapping – wetland seeps and springs** (D.4.2) *Parks*: GOGA

Date started: 10/2003 *Date finished*: 4/2005 *Total elapsed time (months*): 18

Primary investigator: Leslie Long *Institution:* Self-employed
Park contact: Darren Fong

Project abstract: A study of amphibian use of selected seeps, springs, and streams led to a larger inventory of those water bodies throughout the park. The California red-legged frog (*Rana aurora draytonii*) is a federally threatened species. Some critical habitat for the frog is on GOGA lands. The objective of the study was to locate seeps and springs and to determine breeding and/or non-breeding use of these water bodies.

Method: Sites were identified based on vegetation types and GPS locations were taken. Cover boards (2 X 12 X 2 inch), 4 to 6 at each site, and visual surveys were employed to investigate amphibian use. Surveys were done from October 2003 through June 2004. All herpetofauna encountered were documented.

Employees hired: All employees were Biological Technicians

Parvano, Amy	GS-7	0.8 FTE
Willis, Scott	GS-5	0.2 FTE

Taxa studied: vertebrates – herpetofauna

Results and Discoveries: A total of 159 seeps and springs were located on park lands in Marin County. Data collected included important hydrologic conditions such as flow rate. Three California red-legged frogs were seen in both Tennessee Valley and Big Lagoon. Numerous other amphibians were also found to inhabit the moist microhabitats. The California newt (*Taricha torosa torosa*) was the most frequently encountered amphibian followed by the California slender salamander (*Batrachoseps attenuatus*). Other common amphibians included the Pacific tree frog (*Hyla regilla*), American bullfrog (*Rana* catesbeiana), and rough skinned newt (*Taricha granulosa)*. Reptiles encountered included the common garter snake (*Thamnophis sirtalis*), alligator lizard (*Elgaria sp.*), and racer (*Coluber constrictor*).

Citation: Wood, Leslie Long. 2004. GGNRA Tennessee Valley seep and stream amphibian surveys and Big Lagoon amphibian surveys: Final report. Saint Helena, CA. 14 pp.

Products produced: reports, databases, maps

Key words: inventory, Golden Gate, Marin County, amphibian, reptile, herpetofauna, wetland, seep, spring, stream

Inventory Project Accomplishments

Project title: **Mapping – wetland map** (D.4.2) *Parks*: PORE

Date started: 2000 *Date finished*: 2003 *Total elapsed time (months*): 36

Primary investigator: Dave Schirokauer *Institution:* NPS - PORE

Project abstract: The wetlands project map spanned 7 USGS quads covering the Seashore and was composed of several GIS layers including existing US Fish & Wildlife Service (FWS) National Wetland Inventory Data (NWI) data, the park's draft ESRI-generated vegetation map, and the Marin County soils series map. Initially, the park tested the NWI wetland map created by photo-interpretation of 1984 color infra-red imagery (1:65,000) throughout the park and found it lacking. A pilot project to create a detailed map of the 3,750 acre Abbotts Lagoon watershed area was done. In so doing, a detailed botanical inventory of all wetland sites in the watershed was completed.

Method: Initially, an accuracy assessment of existing MWI data concentrated on errors of omission. Field evaluation of wetland vegetation polygons from a recent vegetation map and a reinterpretation of 1982 1:58,000 color infra-red aerial photographs were done. Wetland classification definitions were derived from the FWS standard protocol Classification of Wetlands and Deepwater Habitats of the United States (Cowardin 1979).

Employees hired: All employees were Biological Technicians

Parvano, Amy	GS-5	0.3 FTE
Repko, Melinda	GS-7	0.2 FTE

Taxa studied: plant communities

Results and Discoveries: Field staff visited a total of 210 polygons (43%) of the 484 potential wetland polygons in the draft vegetation map. At least 53% of the wetlands in the study area were not delineated on the NWI data. Isolated small wetlands contributed significantly to species richness but were missed in the NWI due to the scale at which it is created. Over 911 acres within 230 wetland units (polygons) were inventoried and mapped. A new population of the federally endangered Sonoma alopecuras (*Alopecurus aequalis* var. *sonomensis*) was discovered.

Citation: Schirokauer, David, Amy Parravano, and Kevin Noon. 2003. Enhanced wetlands inventory and mapping project, Point Reyes National Seashore. NPS, Point Reyes Division of National Resources, Point Reyes Stations, CA. 27 pp.
Products produced: report, database, maps, and photographs

Key words: inventory, wetland map, Point Reyes, plant community, seep, spring, salt marsh

Inventory Project Accomplishments

Project title: **Abiotic – weather station inventory** (E.5.3) *Parks*: All

Date started: 7/2004 *Date finished*: 2/2005 *Total elapsed time (months*): 7

Primary investigator: Michael De Blasi *Institution:* NPS - SFAN

Project abstract: In order to know where weather and climate data gathering occurs, an inventory of the sites in the SFAN area was done. Fixed and non-permanent weather stations were located.

Method: telephone interviews and internet searches

Inventory budget expended: none

Employees hired:

Mike De Blasi	Bio-Tech	GS-5	0.1 FTE

Results and Discoveries: Several lists were generated – park weather locations and National Climate Data Center weather stations within 50 miles of FOPO (101) and PINN (32). Locations, period of record, and recorded parameters (temperature, precipitation, wind speed and direction, etc.) were added.

	# of full park monitoring stations
EUON	1
GOGA	1
PINN	3
PORE	3

Citation: De Blasi, Mike, 2005. Weather station inventory, San Francisco Bay Area Network. NPS San Francisco Bay Area I&M Network, San Francisco, CA. 13 pp.

Products produced: report, database

Key words: inventory, weather stations, NCDC, San Francisco Bay, Pinnacles, Muir Woods, Point Reyes, Golden Gate, Eugene O'Neil

Appendix E. Detailed Budget Information

[*Note that this appendix has been removed from this public document per the guidance of the National I&M Program.]*

Appendix F. SFAN Inventory Program Participants, 2000 through 2004

Name	Area Represented	Role	Skill	Board/ Tech Comm	Work Group	Project partici pant	Years participated FY00	FY01	FY02	FY03	FY04
O'Neil, Susan	E. Bay/SFAN	Network Biologist	botany	X	X	X				X	X
Fuller, Glenn	EUON/JOMU	Superintendent	management	X			X	X	X	X	X
Fong, Darren	GOGA	Tech. Com. Alt.	aquatic ecology	X	X	X	X	X	X	X	X
Fritzke, Sue	GOGA	Project lead	botany			X					X
Hatch, Daphne	GOGA	Tech. Committee	wildlife	X			X	X	X	X	X
Merkle, Bill	GOGA	Tech. Committee	wildlife	X	X	X				X	X
O'Neill, Brian	GOGA	Superintendent	management	X			X	X	X		X
Press, Dave	GOGA	Park data manager	data mgmt		X	X	X				X
Williams, Tamara	GOGA	Advisor	hydrologist		X			X	X		X
Adams, Phyllis	JOMU	Superintendent	management	X			X	X			
Becker, Ben	PCLC	Advisor	marine ecology		X					X	X
Fesnock, Amy	PINN	Tech. Committee	Wildlife	X	X	X	X	X	X	X	
Herynk, Jason	PINN	Park data manager	data mgmt		X						X
Leatherman, Tom	PINN	Chief Nat. Resource	Botany	X	X	X	X	X	X	X	X
Moore, Chad	PINN	Advisor	geomorphology		X	X	X	X	X	X	X
Muldoon, Cicely	PINN	Superintendent	management	X							X
Petterson, Jim	PINN	Tech. Committee	Wildlife	X	X	X					X
Shackelton, Steve	PINN	Superintendent	management	X			X	X	X	X	
Adams, Dawn	PORE	Tech. Committee	Wildlife	X	X	X	X	X	X	X	X
Benson, Shelley	PORE	Project lead	Lichens			X		X	X	X	
Coppoletta, Michelle	PORE	Project lead	rare plants		X	X		X	X	X	X
Ketcham, Brannon	PORE	Advisor	hydrologist		X	X	X	X	X	X	X
Neubacher, Don	PORE	Superintendent	mgmt, forestry	X			X	X	X	X	X
Roberts, Dale	PORE	Park data manager	data mgmt		X	X				X	X
Rogers, Jane	PORE	Project lead	Botany		X	X					X
Schirokauer, Dave	PORE	Tech Comm. Alt.	GIS biologist	X	X	X	X	X	X	X	X

Name	Area Represented	Role	Skill	Board/ Tech Comm	Work Group	Project partici pant	Years participated FY00	FY01	FY02	FY03	FY04
Shook, Bill	PORE	Chief Nat. Resource	air quality, IT		X			X	X	X	X
Acker, Steve	PWR	Regional Coord.	I&M	X			X	X	X	X	
Allen, Sarah	PWR	Regional Scientist	marine ecology	X	X	X	X	X	X	X	X
Goldsmith, Jay	PWR	Advisor	ecology		X			X	X		
Latham, Penelope	PWR	Regional Coord.	I&M	X						X	X
Rocchio, Judy	PWR	Advisor	air quality, night sky		X			X	X		
Bjork, Jennifer	SFAN	Network Coord.	I&M, ecology	X				X	X	X	X
Cooprider, Mary	SFAN	Tech. Committee	water quality	X	X	X				X	X
Witcher, Brian	SFAN	Network Coord.	data mgmt.	X	X				X	X	X
Simpson, Bobbi	Weed Team	Advisor	invasive plants		X				X	X	X

Appendix G. Unfunded Inventory Abstracts and Formats of Deliverables

The previous 5-years of inventories (2000-2004) concentrated on vertebrates and vascular plants. I&M funds were used to accelerate a few vegetation maps and start inventories of marine species. There are still remaining important information gaps. The following inventory projects have not been completed and funding and support are still needed. The projects are grouped taxonomically or functionally.

Animals – Invertebrates
Dune invertebrates, GOGA, PORE
Intertidal/beach invertebrates, GOGA, PORE
Cave invertebrates, GOGA, PINN, PORE
Freshwater bivalves, GOGA, PORE
Marine macro-invertebrates, GOGA, PORE

Animals – Vertebrates
Herpetofauna, GOGA new lands
Fish, sub-tidal GOGA, PORE
Birds, landbirds, GOGA new lands
Birds, seabird nest cavity distribution, GOGA, PORE
Bats, natural habitat, GOGA, PORE, JOMU
Mice (salt marsh, Pt. Reyes jumping), GOGA, PORE
Small mammals/ herpetofauna, PINN
Mammals, GOGA new lands

Plants - Non-vascular
Lichens, GOGA, JOMU, PORE
Marine plankton, GOGA, PORE
Marine macroalgae, GOGA, PORE

Plants - Vascular
Aquatic vascular plants, GOGA, PORE
Rare & endangered plants, PINN
Vascular plants, GOGA new lands

Habitats/communities
Coastal biological resources, GOGA, PORE
Coastal caves, GOGA, PORE
Geologic hazards, all parks
Local fire history, JOMU
Sub-tidal/ deep-water resources, GOGA, PORE
Coastal kelp marine ecosystem, GOGA, PORE

Maps
Geology maps, all parks
Soil map, JOMU
Vegetation map, PINN
Vegetation map, GOGA new lands
Wetland map, GOGA, PORE

There were several Technical Committee meetings where the unfunded inventory needs were discussed and decisions were made.
1. May 2004. During the meeting to determine the timeline for vital signs indicators, the Technical Steering Committee decided to incorporate some inventories into the implementation of the monitoring. The Vegetation Focus Group was working on the development of three vegetation indicators at the time: invasive species (#2),

rare, threatened, and endangered plant species (#6), and plant community change (#11). They recommended and the Steering Committee accepted their suggestion to include the baseline inventories into the vital signs monitoring as it is initiated:

a. Mapping and characterization of bishop pine, riparian, coastal bluff, and oak woodland plant communities in PORE and GOGA - $125,000 (estimate).
b. Determine the distribution and abundance of 25 high priority non-native plant taxa in PORE and GOGA - $125,500 (estimate).
c. Inventory of invasive non-native plants in PINN - $26,000 (estimate).

All three of the inventory projects had been listed in the Inventory Study Plan's unfunded needs.

2. January 2005. As the Steering Committee reviewed the remaining needs, six types of needs were identified as important. The inventories were grouped into the different need categories for ranking into high, medium and low priorities.

a. Immediate management need, usually included non-native, threatened or endangered species, but other projects qualified, such as the JOMU fire history project.
b. Information for recommending areas for marine reserves.
c. Provided information for a vital sign indicator and was needed to develop monitoring protocols.
d. Created a baseline database for newly acquired lands in GOGA and PINN.
e. Complete a previous survey started during the Natural Resource Challenge funding period.
f. Fell into a previously untargeted taxonomic group.

3. February, 2005. The inventory projects were grouped into high, medium and low priorities in order to develop a strategy to develop work plans, grant applications, and budgets and to obtain partners over the next five years. At this time, project leaders volunteered themselves or were nominated. These individuals will be responsible for the development and implementation of the inventory project. The initial work will only be for those projects ranked as a high priority. Details for the remaining projects will be sketchy at best until they move up in priority.

The following nine inventories, in alphabetical order, were considered a high priority:

Aquatic vascular plants (GOGA/PORE) – new inventory, wetland indicator need
Coastal biological inventory (GOGA/PORE) – complete ongoing inventory
Freshwater bivalves (GOGA/PORE) – new inventory, package as a "search-and-destroy" project since primary target is looking for non-native species (but we get an inventory in the process)
Natural soundscape (MUWO) – new inventory, management need for planning, pilot project
Sub-tidal/deep water (GOGA/PORE) – complete ongoing inventory
Vascular plants (GOGA/PINN) – new land surveys
Vegetation map (PINN) – complete ongoing project
Vegetation map (GOGA) – new lands, for planning & monitoring design
Wetland mapping/invert surveys (GOGA) – complete ongoing inventory

SFAN decided than the I&M program could only provide "seed" funding for cost sharing with partners.

The spreadsheet that was used to develop the priorities is Table XX and follows. Draft mini-abstracts for the needed inventories follow the spreadsheet. Many still contain the language from the 2000 Inventory Study Plan and will need modification when preparing write-ups for funding calls and grant proposals.

Table 33. Unfunded informational gaps to fill during 2005-2010.
Row color: gray = in Inventory Study Plan; green = new lands survey need; blue = marine survey need; white = other
Red numbers need checking

Unfunded Inventory Project	Rank	Amount Needed	Previous Amount	FY05	FY06	Parks: EUON	FOPO	GOGA	JOMU	MUWO	PINN	PORE	PRES	PMIS #	Project Lead
Coastal biophysical	H	47000	80986	0	0		1	1				1			Schirokauer
Sub-tidal/deep water	H		25000	0	0			1				1			Becker
Aquatic vasc. plants	H	10500	0	0	0			1				1			Fritzke, Rodgers
Vasc. plants, new lands	H		0	0	0			1			1			82189	Franklet, Fritzke
Freshwater bivalves	H	8000	0	0	0			1				1			Fong, Ketcham
Natural soundscape	H		0							1					Schirokauer
Vegetation map, PINN	H	0	252239	42035	26710						1				Franklet
Veg. map, new land	H		0	0	0			1							Franklet, Fritzke
Wetland map/inventory	H		30000	0	0			1							Fong
Lichens	M		26439	0	0	1	1	1	1	1		1	1		Coordinator
Macro-inverts/ plankton	M	50000	0	0	0		1	1				1	1	87056	Adams, Fong
Herps, new lands	M		0	0	0			1			1				Merkle, Petterson
Landbirds, new lands	M		0	0	0			1			1				Merkle, Petterson
Cave invertebrates. PINN	L	7000	0	0	0						1				Petterson
Dune invertebrates	L	7000	0	0	0			1				1	1		Adams
Intertidal/beach inverts	L	45000	0	0	0		1	1				1	1	36760	Adams
Sub-tidal fish	L		0	0	0			1				1			Becker
Seabird, cav. nest. dist.	L	15000	0	0	0			1				1		3363	Merkle
Bats, natural habitat	L	120000	58859	0	0			1	1			1			Petterson
Sm. mammals/herps, PINN	L	0	18686	3500	done						1				Petterson
Mammals, new lands	L		0	0	0			1			1				Merkle, Petterson
SM/PR mice	L	50000	8962	0	0			1				1			Adams
Data mining/certification	L		142104	13324	0	1	1	1	1	1	1	1	1		Coordinator
Coastal caves	L		0	0	0		1	1				1			Hatch
Fire history	L		0	0	0				1						JOMU Supt.
Geologic hazards	L		0	0	0				1						GRD
Soil map	L	0	0	0	0				1					87056	GRD
TOTAL amount needed		359500	643275	58859	26710	2	6	20	6	3	8	14	5		
Number of inventories for each park															
Total number of inventories needed						**27**									

High Priority Inventory Projects:

AQUATIC VASCULAR PLANTS

Justification: Based on the best professional judgment of NPS biologists and local botanical experts, PORE's inventory of terrestrial vascular plants is over 90% complete. The aquatic vascular plants have not received the level of survey intensity as have the terrestrial plants.

Method: A minimum of 30% of all aquatic sites in the park will be sampled. A stratified random sampling strategy will be used to determine the sites to be sampled to ensure that all vegetation associations and habitat types are represented adequately in the sampling.

Deliverables: Digital and hardcopy database listing species identified, location, date, nativity (native, non-native, rare); and a final report which will include photographic documentation of dominant vegetation. Database, GIS, photographs, field data all meeting SFAN deliverable standards. All species entered into NPSpecies and the report in NatureBIB.

Budget:

NPS Salary (or contract)
Travel
Equipment/ supplies

Estimated Cost: $ _0,000
Potential Funding Source(s): Water Resources Division

COASTAL BIOLOGICAL.
This inventory work was awarded a $50,000 California Department of Fish and Game grant using oil spill funding and will continue through FY06.

FRESHWATER BIVALVES

Justification: High densities of the Asian clam (*Corbicula fluminea*) have been implicated in the decline of native unionid mussels. At least one native mussel, the California floater (*Anodonta californiensis*), is still present within Lower Lagunitas Creek, PORE. The California floater is considered a species of concern. Survey efforts are urgently needed to determine the extent of native and introduced bivalves and the habitat conditions that may influence their distribution.

Methods: Systematic instream surveys will be conducted to determine species composition and abundance of native and introduced bivalves in depositional areas of lower Lagunitas, Olema, and Redwood Creeks, and the freshwater/brackish regions of the PORE Esteros. Survey activities will consist of either times visual surveys or use of clam rakes along belt transects across the creeks. Biological surveys will be preceded by physical habitat surveys to document the location of the depositional areas to place upstream and downstream limits for survey activities. Survey data will determine the extent of the non-native clams.

Deliverables: Report with species list, database, GIS, photographs, field data all meeting SFAN deliverable standards. All species entered into NPSpecies and the report in NatureBIB.

Estimated Cost: $ 8,000
Potential Funding Source(s): xxx

NATURAL SOUNDSCAPE, MUWO. Funding came from the GOGA planning department to obtain a baseline of sounds at MUWO for the General Management Plan and a potential air traffic plan. Sound attenuation and sound

level monitoring begins July 2005. The park is working with the NPS Natural Sounds Program and the Natural Sound Society to accomplish the sound monitoring and recording.

SUB-TIDAL/ DEEP WATER

Justification: The marine environment along the PORE and GOGA coastlines is one of the most biologically diverse and productive marine regions in the world. The two parks share boundaries with Cordell Banks, Gulf of the Farallones, and Monterey Bay National Marine Sanctuaries. In addition, several marine areas along the PORE coastline receive protection under state designation. Habitat mapping will allow for the assessment of habitat change due to natural or anthropogenic factors assist in habitat-based fish and invertebrate inventories and monitoring, design and location of future marine reserves, and assessment of species distributions and spawning grounds.

Methods: The Monterey Bay NMS characterized the habitats of the continental shelf between Monterey and San Francisco and at select locations along the GOGA and PORE coastline with very high resolution side scan and multi-bean remote sensors. Resource managers concurred that of the approximately 35 square miles, Tomales Bay, Drakes's Estero, Tomales Point, Point Reyes headlands, and Double Point are the top priority sites. The strategy to complete this project is to:

1. collect seafloor data using the best and most appropriate technology, i.e., side-scan sonar, LIDAR, and multi-beam sounders
2. create the initial set of baseline habitat maps
3. ground truth the baseline maps for accuracy through random stratified sampling of habitat type and use sediment cores and grabs, drop cameras, submersibles, and/or ROV's
4. use GIS to combine geophysical habitat data (depth, slope, aspect, substrate) with species distributions

This study is costly and covers several years. Funds from the I&M program in 2003 and 2004 helped initiate the project and leverage funding from other sources. The Moss Landing Marine Labs hold the first contract to map the seafloor habitat.

Deliverables: Report with species list, database, GIS, photographs, field data all meeting SFAN deliverable standards. All species entered into NPSpecies and the report in NatureBIB.

Estimated Cost: $ 350,000 (NPS contribution through I&M funds = $35,000)
Potential Funding Source(s): participating partners

VASCULAR PLANTS, NEW LANDS

Justification: GOGA and PINN recently added new lands to their parks. These new lands have had no systematic surveys. Very little is known of the flora and fauna. The first study that is needed is a baseline inventory of the vascular plants.

Methods: xx

Deliverables: Report with species list, database, GIS, photographs, field data all meeting SFAN deliverable standards. All species entered into NPSpecies and the report in NatureBIB.

Estimated Cost: $ 0,000
Potential Funding Source(s): xxx

VEGETATION MAP, PINN. This is an on-going project scheduled to continue through at least FY06 and will continue using I&M monitoring funds.

VEGETATION MAP, GOGA NEW LANDS

Justification: New lands were recently added to the south district of GOGA. The land has not been systematically surveyed or mapped. The map of these lands is needed as a baseline for planning, for focusing systematic sampling for other inventories and studies, and for protection of resources.

Methods: The map will use vegetation classification associations in the current map so that it will be comparable and will merge with the GOGA map as a whole.

Year 1 – obtain aerial photography (if not already in hand) and make draft map
Year 2 – ground truth draft map

Deliverables: Digital and hardcopy maps, a report of the mapping process and selected vegetation associations.

Estimated Cost: $ unknown
Potential Funding Source(s): xxx

WETLAND MAPPING, GOGA

Justification: Wetland and aquatic sites provide significant habitat for fish and wildlife, including sensitive wildlife species such as the California red-legged frog, and important hydrologic functions, such as water quality, quantity, and fluctuation. This study would complete the inventory of existing wetland and aquatic sites within the Golden Gate NRA to facilitate their protection. In addition, wetland sites with potential for restoration will continue to be identified.

Methods: Wetland and aquatic sites will be mapped in accordance to the US Fish and Wildlife's Cowardin classification system. This system focuses on the presence of hydrophytic vegetation, hydric soils, or evidence of surface water. GPS locations will be taken for each water body. Photographs will be taken to document typical wetland sites.

Deliverables: A relational MS Access database and GIS-based wetland map in ArcView compatible format will be produced. Attributes will include Cowardin classification, wetland acreage type, nature of threat, hydric soil class, dominant vegetation, and presence of amphibians. A report will be written using the standard SFAN report format and include the photographs. Field notes will be delivered with the other deliverables.

Estimated Cost: $45,000
Potential Funding Source(s): NRPP, WRD, cost-share with Water District or county?

Medium priority projects

include the following in alphabetical order:

Herpetofauna, new lands – new lands baseline inventory
Landbirds, new lands – new lands baseline inventory
Lichens, (JOMU/GOGA/MUWO/PRES) – continuation study of parks not yet surveyed
Macro-invertebrates/plankton (GOGA/PORE) – new inventory, marine resources

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HERPETOFAUNA, NEW LANDS

Justification: xxx

Methods: xx

Deliverables: Report with species list, database, GIS, photographs, field data all meeting SFAN deliverable standards. All species entered into NPSpecies and the report in NatureBIB.

Estimated Cost: $ 0,000
Potential Funding Source(s): xxx

LANDBIRDS, NEW LANDS

Justification: xxx

Methods: xx

Deliverables: Report with species list, database, GIS, photographs, field data all meeting SFAN deliverable standards. All species entered into NPSpecies and the report in NatureBIB.

Estimated Cost: $ 0,000
Potential Funding Source(s): xxx

LICHENS

Justification: xxx

Methods: xx

Deliverables: Report with species list, database, GIS, photographs, field data all meeting SFAN deliverable standards. All species entered into NPSpecies and the report in NatureBIB.

Estimated Cost: $ 0,000
Potential Funding Source(s): xxx

MARINE MACRO-INVERTEBRATES

Justification: xxx

Methods: xx

Deliverables: Report with species list, database, GIS, photographs, field data all meeting SFAN deliverable standards. All species entered into NPSpecies and the report in NatureBIB.

Estimated Cost: $ 0,000
Potential Funding Source(s): xxx

Formats of Deliverables for Inventories

The SFAN developed this sheet to meet servicewide standards and to make the inventory reports more uniform. All products from the inventory projects, those described above and those completed with other funding, need to meet these basic standards. As inventory deliverables are forwarded to the national office, they will be required to meet these standards.

Deliverables that are digital:

Database	(MSACCESS or import compliant, including relevant metadata). Database design will be approved by NPS.
Species list	(complete list of all species observed)
GIS Coverages	(Spatial representation of all sample sites. ESRI format, following I&M GIS standards, including relevant metadata. (full details can be found at http://www.nature.nps.gov/im/gis/docs/GISSpec4.doc) This information should also be posted to the NPS GIS Clearinghouse depending on sensitivity.)
Reports	(MSWORD or PDF file) - format will be the following:

Table of contents
Abstract (separate page)
Background
Methods
Results
- Total numbers
- Unexpected encounters
- Distribution
- Abundances

Discussion
Recommendations
- Areas/taxa needing the highest protection
- Future studies

Protocol	(if not included in report)
Digital Images	(Copy of digital image if image is used as a voucher specimen)

Deliverables that are paper:

Reports	(submitted to relevant park library or document management system and network office)
Field sheets /notebooks	If originals are stored by park based researcher, please indicate location. Optionally copies of field sheets/notebooks (digital or hardcopy) will be maintained in network office.

Deliverables that are vouchers:

Specimens (List of vouchers and storage facility where located, spreadsheet providing ANCS+ information)

All of these components should be submitted to the network office on CD or to an FTP site (ftp.nps.gov/incoming/sfan/data).

Appendix H. Inventories Completed Prior to 2000

The following sheets provide metadata information about the project – citation, abstract, key words, start and end date, primary investigator and institution. For inventory program purposes, additional information was provided which included a budget, employee names, data summaries, results and discoveries, and products produced. The BibKey # refers to the unique number provided to the citation by the NatureBib application. A form was developed to contain relatively the same information for every project.

Inventory Project Accomplishments

Project title: **Birds – landbirds** (B.2.7) *Park*: GOGA, PORE, PRES

Date started: 4/1999 *Date finished*: 5/2000 *Total elapsed time (months)*: 13

Primary investigator: Maureen Flannery *Institution:* PRBO-Conservation Science
Park contact: Sarah Allen, PORE Science Advisor

Project abstract: A total of 131 bird species were recorded at point count stations over the two-year inventory. Surveys were conducted during the breeding seasons of 1999 and 2000. Sixty-one transects were installed with 697 point count stations in three national parks, GOGA, PORE, and PRES. Point count stations were established in 23 defined habitat alliances. Bird diversity, species richness, and relative abundance were obtained for each alliance. Seventy-one species of birds were documented. The song sparrow was detected all habitats in all parks.

Method: Standardized fixed-radius point count censuses were conducted. Transects consisted of multiple point count stations, spaced 200-250 m apart. At each station, a 5-min, 50-meter census was conducted. All birds detected within the 5-minutes were recorded. Twenty-three habitats were assigned at the alliance level. Transects were selected using stratified random sampling techniques. During the 1999-2000 breeding season, 36 new transects consisting of 357 point count stations were established. 1998 census data were included in the analysis of the data. Through evaluation of data, we determined which habitats needed additional points.

Ralph, C.J., G.R. Geupel, P.Pyle, T.E. Martin, and D.F. DeSante. 1993. Field Methods for Monitoring Landbirds. USDA Forest Service Publication, PSW-GTR 144, Albany, CA.

Ralph, C.J., J.R. Sauer, and S.Droege. 1995. Monitoring Bird Populations by Point Counts. USDA Forest Service Publication, PSW-GTR 149, Albany, CA.

Cooperative Agreement # H853095002-3 portion of $173,000 (estimate $40,000)

Employees hired: none

Taxa studied: Birds

Results and Discoveries: A total of 131 species were recorded over the 2-year inventory. Only one landbird species, the song sparrow, was detected in all habitats within the 3 SFAN parks. Seven species of birds were detected in all habitats except the dune sagewort: Allen's hummingbird, Bewick's wren, California towhee, purple finch, spotted towhee, and Wilson's warbler. Red alder, Bishop pine and Monterey pine habitats had the highest diversity and species richness of bird species. Coast live oak had the highest bird abundance of all habitats followed by Monterey pine and red alder. Low diversity, richness and abundance were found in grassland and dune sagewort.

Habitat alliance (more than 5 points sampled)	# of pt.count Stations	Mean diversity (N1)	Mean species richness	Cumul. species richness	Index of abund.
Annual grassland	63	2.25	2.63	27	2.8
Bishop pine	26	8.86	10.19	28	7.1
California bay	44	7.26	8.36	49	5.3
Coast live oak	22	6.80	7.73	45	8.4
Coast redwood	50	5.32	5.96	35	3.8
Coyote brush	114	4.45	5.33	45	4.5
Douglas fir	88	7.82	9.16	47	6.2
Dune sagewort	12	1.38	1.58	5	1.6
Eucalyptus	28	7.78	9.21	36	6.0
Monterey pine	9	7.09	8.33	29	7.7

Red alder	44	8.77	10.55	43	7.5
Tanoak	11	5.32	6.00	19	3.3
Willow	97	7.42	9.21	46	7.2

Citation: Flannery, Maureen E., Diana L. Humple, Grant Ballard, and Geoffrey R.Geupel. 2001. Landbird inventory of the National Parks of the San Francisco Bay area: Final report. PRBO Conservation Science, Stinson Beach, CA. Contribution #1004. 40 pp. BibKey # 551937.

Products produced: report, database, and map

Key words: inventory, bird, landbird, breeding bird survey, point count, GOGA, PORE, PRES

Inventory Project Accomplishments

Project title: **Birds – landbirds** (B.2.7) *Park*: GOGA

Date started: 4/23/1997 *Date finished*: 12/1997 *Total elapsed time (months)*: 9

Primary investigator: Tom Gardali & Geoff Geupel *Institution:* PRBO Conservation Science
Park contact: Sarah Allen, PORE Science Advisor

Project abstract: The goal of the project was to determine relative abundance, species richness, and species diversity by site and habitat type. All study sites were in western Marin County, California.

Method: The survey was conducted during the spring of 1997. Seventy-five point count stations were established. A fixed-radius point count was used. In order to relate changes in bird composition and abundance to differences in vegetation, vegetation assessments were done at each point using a releve. The cover, abundance, and height of each vegetation stratum were estimated. Analysis was restricted to species of passerines and near-passerines.

Employees hired: none

Taxa studied: Birds

Habitat	*# of Stations*	*Diversity*	*Richness*	*Total individuals*	*Mean #/ sta./visit*
Riparian	66	24.32	53	1357	21
Grazed grassland	7	4.59	7	21	3
Ungrazed grassld.	11	18.66	26	112	10
Grassland/scrub	45	15.27	32	529	12
Mixed hardwood	9	19.02	27	154	9

Results and Discoveries: A total of 65 bird species were detected. Stewart Ranch had the highest diversity followed closely by Tennessee Valley and Lagunitas Creek. Coyote Ridge Trail had the lowest diversity. Riparian areas showed maximum measures of diversity and richness as well as mean number of individuals. Ungrazed grassland was richer than grazed grassland by 19 species and had a diversity index four times as great. Frequently encountered species included the American goldfinch, Bewick's wren, chestnut-backed chickadee, Anna's hummingbird, bushtit, California quail, Wilson's warbler, and wrentit. The most abundant species was the song sparrow.

Citations: Gardali, Thomas & Geoffrey R. Geupel. 1997. Songbird inventory and monitoring in the Golden Gate National Recreation Area: Results from the 1997 field season. Point Reyes Bird Observatory Conservation Science, Stinson Beach, CA. 25 pp.

Products produced: report, database

Key words: inventory, Golden Gate, Marin County, Tennessee Valley, Lagunitas Creek, Stewart Ranch, Coyote Ridge Trail, Stinson's Gulch, Redwood Creek, point count, species richness, diversity, songbird

Inventory Project Accomplishments

Project title: **Birds – landbirds** (B.2.7) *Park*: MUWO

Date started: 4/22/1997 *Date finished*: 5/2000 *Total elapsed time (months)*: 37

Primary investigator: Tom Gardali & Geoff Geupel *Institution:* PRBO Conservation Science
Park contact: Daphne Hatch, GOGA Wildlife Biologist

Project abstract: Muir Woods National Monument contains the last contiguous stand of old-growth redwood and Douglas fir in Marin County, California. Baseline information regarding the status of breeding birds was lacking. A 3-year inventory began in the summer of 1997. Fifty-five species were encountered.

Method: The survey was conducted during the three consecutive summers. Five-minute, fifty meter, fixed radius point count stations were established 200 meters apart. A total of 45 permanent point count stations were established in the old growth forests within the Redwood Creek watershed: 15 on Ben Johnson trail, 15 on Bootjack trail, and 15 off-trail. All stations were censused three times each summer. Nine boat surveys were used to look for marbled murrelets.

Cooperative Agreement # 1443-CA-8140-96-003

Employees hired: none

Taxa studied: Birds

Transect	*# of stations*	*Diversity*	*Richness*
Ben Johnson	15	10.15	21
Bootjack	15	14.65	25
Off-trail	15	13.36	24

Results and Discoveries: A total of 55 bird species were detected. Pacific-slope flycatchers were the most abundant species and were detected at 93% of the census points. Other common species include winter wrens, chestnut-backed chickadees, golden-crowned kinglets, brown creepers, and dark-eyed juncos. In two of the three years, species diversity was highest on the Bootjack transect. It differs from the others in that Douglas firs, rather than redwoods, were the dominate trees. No marbled murrelets, Vaux's swifts, sharp-skinned hawks, Cooper's hawks, northern saw-whet owls, or hermit warblers were detected during the point counts. A total of 20 species of birds were detected during the marbled murrelet surveys.

Citations: Gardali, Thomas & Geoffrey R. Geupel. 2000. Bird monitoring in the Muir Woods National Monument: summary of results from 1997-1999 and suggested long-term monitoring plan. Point Reyes Bird Observatory Conservation Science, Stinson Beach, CA. 64 pp. BibKey # 143324.

Products produced: report, database, maps

Key words: inventory, Muir Woods, Ben Johnson trail, Bootjack trail, point count, species richness, diversity, songbird, old growth forest, Douglas fir, marbled murrelet

Inventory Project Accomplishments

Project title: **Birds – landbirds** (B.2.7) *Park*: PRES

Date started: 4/1999 *Date finished*: 9/2002 *Total elapsed time (months)*: 41

Primary investigator: Tom Gardali *Institution:* PRBO Conservation Science
Park contact: Daphne Hatch, GOGA Wildlife Biologist

Project abstract: The goal of the project was to document at least 80% of breeding landbird species in this urban park.

Method: The survey was conducted during the summers of 1999, 2001 and 2002. Twenty-seven point count stations were established. Survey points were not selected at random, but were targeted to four general habitat types: coastal/dune scrub, Monterey cypress, eucalyptus, and riparian woodland. A fixed-radius point count was used in 1999, which was switched to a variable point count in 2000 and 2001 in order to calculate detection probability. Statistical analysis used relative abundance in order to accommodate the 1999 data. Analysis was restricted to species of passerines and near-passerines.

Employees hired: none

Taxa studied: Birds

Results and Discoveries: A total of 61 bird species were detected by point count, 44 in 1999, 41 in 2001, and 44 in 2002. The most abundant species were house finch, Nuttall's white-crowned sparrow, American robin, pygmy nuthatch, and Allen's hummingbird. Species richness and diversity showed no strong patterns by habitat type or location. The highest species richness and diversity were at point number 25, an ecotone with diverse shrub and tree layer.

Citations: Gardali, Thomas. 2002. Monitoring songbirds in the Presidio, 1999 to 2002 final report. Point Reyes Bird Observatory Conservation Science contribution #1065, Stinson Beach, CA. 28 pp.

Products: report, database, maps

Key words: inventory, Presidio, point count, species richness, diversity, songbird

Inventory Project Accomplishments

Project title: **Bats** (B.2.8) *Park*: MUWO

Date started: 1999 *Date finished*: 2001 *Total elapsed time (months*): 60

Primary investigator: Paul Heady and Winifred Frick *Institution:* Central Coast Bat Research Group
Park contact: Bill Merkle, GOGA Wildlife Biologist

Project abstract: Previous to this survey, MUWO had no systematic bat surveys. This 24-month field study was to determine bat species presence and to evaluate spatial and seasonal distribution and relative abundance.

Method: Guano trapping, acoustic sampling, and mist netting were the three primary techniques used to document bat presence. Twenty-six guano traps were installed in redwood hollows to evaluate the use of hollows by roosting bats. Traps were checked monthly. Trees that had bat activity were subsequently acoustically monitored and bats were mist netted. Twenty-one nights of mist netting were conducted along Redwood Creek and Deerpark Ridge. Acoustic sampling used an Anabat II bat detector system (Titley Electronics) placed on the ground facing an opening in the canopy above Redwood Creek. Thirty-three nights of sampling took place at roughly monthly intervals for 24 months.

Employees hired: none

Taxa studied: Vertebrates, bats

Mist net captures	69 individuals of 9 species

Results and Discoveries: Ten bat species were identified foraging and roosting in MUWO. Nine of the species were captured in mist nets. The Mexican free-tailed bat (*T. brasiliensis*) was detected acoustically but not captured. Mist net captures declined steadily over the duration of the study. Investigators believed that this reflected the bat's ability to learn to detect and avoid the nets. Reproductively active females were captured, indicating maternity use in MUWO by 4 species. The Yuma myotis (*Myotis yamanensis*) and the hoary bat (*L. cinereus*_ were only detected in the riparian corridor and never captured on the ridge. Silver-haired bats (*L. noctivagan*) were regularly captured in redwood grove areas, but were not captured in the downstream riparian areas. Twenty-five of the 26 guano traps showed used by bats demonstrating regular use of basal redwood hollows. Year-round use by nearly all of the species detected was remarkable.

Of the ten species that occur in MUWO, 4 are federal species of special concern and 1, a California species of special concern. The main threats to the bats are human disturbance to maternity roosts and prescribed burning of the forest.

The ten species of bats identified in MUWO represents at least 63% of the bats likely to occur in the general region. Two species, the long-eared myotis (*Myotis evotis*) and the pallid bat (*Antrozous pallidus*) are two species expected in the region in redwood forest habitat, but were not documented during the study.

Citation: Heady, Paul A. and Winifred F. Frick. 2004. Bat inventory of Muir Woods National Monument, 1999-2000. Central Coast Bay Research Group, Aptos, CA. 21 pp.

Products produced: report, database

Key words: inventory, bat, Golden Gate, Anabat, echolocation

Inventory Project Accomplishments

Project title: **Special taxa – waterbirds /shorebirds** (C.3.8) *Park*: PORE,, GOGA, FOPO, PRES

Date started: 11/1998 *Date finished*: 2/1999 *Total elapsed time (months)*: 4

Primary investigator: Jennifer White *Institution:* PRBO-Conservation Science
Park contact: Sarah Allen, PORE Science Advisor

Project abstract: The survey objective was to survey waterbirds and shorebirds during the winter in three national parks, GOGA, PORE and PRES.

Method: Estuaries were surveyed every two weeks for a total of 6-7 times. Each large estuary was separated into subsections and teams of two people covered each area. For example, Drake's Estero was split into five sub-sections requiring 8-10 people for the entire estuary. Total counts of dabbling ducks and shorebirds were obtained. Diving duck counts were estimated due to difficulties associated with size and access in some of the estuaries. Therefore, they were probably under estimated and cannot be directly compared. Other birds that were counted included belted kingfishers, raptors and ring-billed gulls. Surveyors listed the presence of all gull species. Species richness was calculated.

Cooperative Agreement # H85309502-010 part of $173,000 (estimated at $43,000)

Employees hired: none

Taxa studied: Waterbirds

Estuary/park	# surveys	# sub-sections	Avg. species richness
Abbott's Lagoon, PORE	7	4	41 (26-60 range)
Home Bay,	6	1	58
Schooner Bay	6	1	51
Creamery Bay	6	1	47
Barries Bay	6	1	41
Drake's Spit	6	1	11
Sunset Beach	6	1	27
Sunset Pond	6	1	14
Outer Drake's Bay	6	1	42
Drake's Estero	6	1	73
Horseshoe Pond	6	1	31
Limantour Estero	6	1	66
Bolinas Lagoon	7	1	74
Rodeo Lagoon	7	1	38
Rodeo Pond	7	1	10
East Fort Baker	7	1	25
Fort Point	7	2	27

Results and Discoveries: The highest species richness was at Bolinas Lagoon and Drake's Estero. The most common bird was the ruddy duck followed by the American widgeon, dunlin, buffelhead, least sandpiper, western sandpiper, and marbled godwit. Of note at the GOGA sites were the large number of western grebes at Fort Point in late February.

Citations: White, Jennifer D. 1999. Bird inventory of three national parks of the San Francisco Bay area: Wintering waterbirds and shorebirds. PRBO Conservation Science, Stinson Beach, CA. 41 pp. BibKey # 163538.

Products produced: report, database

Key words: inventory, waterbird, shorebird, GOGA, PORE, PRES